Infrastructure Canada

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K1P 0B6

Environmental and Aboriginal Consultation Information Requirements

As part of the application process for funding, applicants are required to complete the following questionnaire in order for Infrastructure Canada (INFC) to determine if the *Canadian Environmental Assessment Act, 2012* (CEAA, 2012) and/or environmental assessment process in Northern Canada apply to the project. In addition, the information provided will also be used by INFC to determine if there is a requirement to consult with Aboriginal Groups.

All italicized text is instructional and is provided to explain in more detail the type of information requested by INFC. This instructional text can be deleted once information is provided in the appropriate boxes. Please provide your response in the spaces provided below, expanding the boxes as necessary.

Note that if you have any questions filling out the questionnaire; please submit your questions to the following email address: INFC.AboriginalConsultEnv-Consultautochtonesenv.INFC@canada.ca.

General information
Project Name: Undersea Fibre Optic Cable Installation linking Greenland, Nunavut and Quebec
Contact person for any question Infrastructure Canada could have regarding the environmental assessment and aboriginal consultation: Name: Linda Casson Address: Phone: 867-975-5336 Email: lcasson@gov.nu.ca

Project - existing environment
Description of the existing environment: The fiber optic cable will be laid on the seabed under the Davis and Hudson Straits. The cable will be coming on land in Nuuk, Greenland, Iqaluit, Kimmirut, Cape Dorset and Sanikiluaq, Nunavut. Branch units will be installed for future expansion

Project Location Part

PL.1.1: Would any part of the project or activities be located on:		
Yes ☐ No ☑	Federal land. If yes, provide details regarding the federal land administrator:	
Yes ☑ No ☐	Provincial land. If yes, provide details: *Beaches on landing sites*	
Yes ☐ No ☑	Indian Reserve land. If yes, provide details:	
If you answered "**yes**" to any of the above.	Is the entire project footprint located on that land? If not, please indicate the portions that will take place on that land Undersea Fiber Optic Cable System	Yes ☐ No ☑

PL.1.2: Would any part of the project or activities be located in:	
Yes ☑ No ☐	Internal waters of Canada, in any area of the sea not within a province *Internal waters refers to: the internal waters of Canada as determined under the* Oceans Act, *including the seabed and subsoil below and the airspace above those waters.*

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Yes ☑ No ☐	The territorial sea of Canada, in any area of the sea not within a province *Territorial sea refers to:* *The territorial sea of Canada as determined under the <u>Oceans Act</u>, including the seabed and its subsoil below and the airspace above that sea.*
Yes ☑ No ☐	The exclusive economic zone of Canada *Exclusive economic zone refers to:* *The exclusive economic zone of Canada as determined under the <u>Oceans Act</u>, including the seabed and its subsoil.*
Yes ☐ No ☑	The continental shelf of Canada *Continental shelf refers to: the continental shelf of Canada as determined under the <u>Oceans Act</u>.*
If you answered "**<u>yes</u>**" to any of the above:	Please provide the information regarding the land administrator. *Nunavut Land Claim Agreement*

This section is not required if a KML file with project location is provided

PL.2 In order to facilitate and accelerate INFC's assessment of your application for funding, please provide an accurate project location in order for INFC to geographically locate your project.		
Option 1: Project with a fixed address		
Address of the project Civic Number: Unit/Suite/Apt: Street Name: Municipality: County: Province: Postal Code:	Location 1	Location 2
Project Longitude: Project Latitude:		
Option 2: Project with no fixed address or multiple components		
Please indicate, <u>for each project component</u>, any points of interest, intersections, major highways or streets, or other physical characteristics located in the vicinity of the project (e.g. near airport, adjacent to Lions Gate Bridge, 3 km east from Centennial Park, at intersection of Fifth and Queen, etc.)		
Component A:		
Component B:		
Component C:		

PL.3 Project Location Documents	
A project location map, as a minimum, has been included with this questionnaire. *If available, include also any other additional project map (e.g. site plan, etc.) that may be useful in locating the project.*	Yes ☑

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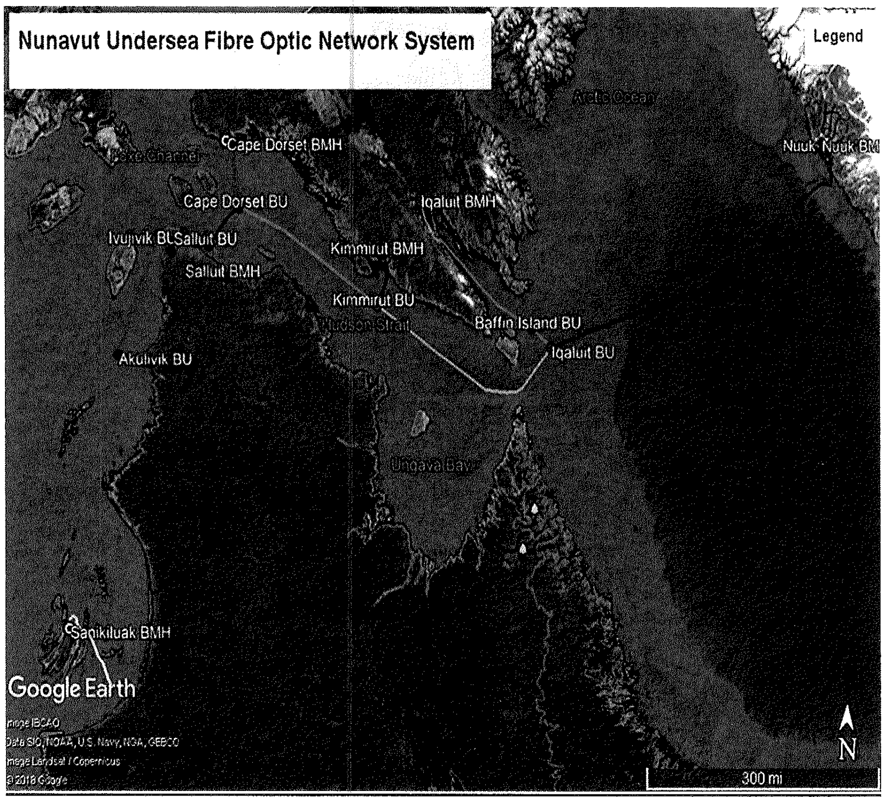

Environmental Requirement Part

ER.1.1: Does any part of your project involve the construction, operation, decommissioning or abandonment of the following infrastructure?	
Yes ☐ No ☑	Electrical transmission lines
Yes ☐ No ☑	Electrical generating facility
Yes ☐ No ☑	Structure for the diversion of water including dam, dyke or reservoir
Yes ☐ No ☑	Canal, lock or structure to control water level
Yes ☐ No ☑	Oil and gas pipeline
Yes ☐ No ☑	Marine terminal
Yes ☐ No ☑	Railway line and / or Railway yard
Yes ☐ No ☑	All season public highway
Yes ☐ No ☑	Aerodrome or airport runway
Yes ☐ No ☑	Hazardous waste facility
Yes ☐ No ☑	Waste management facility
Yes ☐ No ☑	Industrial facility

ER.1.2: Are any part of the project or activities proposed within:	
Yes ☐ No ☑	A wildlife area *A wildlife area means: (according to the wildlife areas listed in Schedule 1 of the Wildlife Area Regulations).* *To use this list, find the section corresponding to the province in which the project is located and then determine if the project is located in one of the wildlife areas listed. If necessary, the cadastral lot numbers can be used.*
Yes ☐ No ☑	A migratory bird sanctuary *A migratory bird sanctuary means: (according to the migratory bird sanctuaries listed in the schedule of the Migratory Bird Sanctuary Regulations).*

	To use this list, find the section corresponding to the province in which the project is located and then determine if the project is located in one of the bird sanctuaries listed. If necessary, the geographical coordinates expressed in latitude and longitude can be used.

ER.1.3: Is the project a designated project according to the *Regulations Designating Physical Activities**? *__http://laws-lois.justice.gc.ca/eng/regulations/SOR-2012-147/index.html__ __*If a project appears on the list, it will likely be considered a designated project and has to be referred to the Canadian Environmental Assessment Agency. Should this be the case, it is recommended you contact them as soon as possible to confirm their requirement and process.*__	
Yes ☐	Please elaborate:
No ☑	
Unknown ☐	*It is possible that the project's status in the Regulations Designating Physical Activities is unknown at the time of the application.*

ER.1.4: If you have answer yes to previous question ER1.3 (i.e. the project is a designated project), have you provided the Canadian Environmental Assessment Agency with a project description as per Section 8(1) of the Canadian Environmental Assessment Act, 2012?
Yes ☐ No ☑ *covered as part of the NIRB application process* *To learn more about the information required by the Canadian Environmental Assessment Agency (Agency), please refer to the <u>Prescribed Information for the Description of a Designated Project Regulations</u>*

ER.2: Does the project (either in full or in part) require an environmental assessment under a northern regime or other regime?	
Yes ☑	Please elaborate: *Nunavut Impact Review Board, Nunavut Planning Commission*
No ☐	

ER.3: Are public concerns expected as a result of this project? The project may have potential to cause significant public concern. Here is a non-exhaustive list of examples: •Water and/or land use disputes and the possible cumulative effects of an unequal distribution of access rights to the land or water in question; •Health and safety risks from potential accidents (e.g. potential spills in water bodies, etc.); •Breaches of the cultural values of local communities; •Etc. If the public is concerned about the project, information on the nature of the concern and any other relevant information must be provided to INFC.	
Yes ☑	Please elaborate: *the public has strong interest in the availability of improved bandwidth.*
No ☐	

ER.4.1: Are environmental issues expected as a result of this project?	
Yes ☑	Please elaborate: *where the cable comes to land, there may be environmental concerns, however these will be minimal*
No ☐	

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ER.4.2: Is any part of the project located in whole or in part on land potentially contaminated by previous activities:	
Yes ☐	Please elaborate:
No ☑	

ER.4.3: Is an environmental site assessment available for this project regarding contaminated site(s):	
Yes ☐	No ☑
If you answered "**yes**" to any of the above, please provide copies of all reports related to the project, if not already provided. If the report(s) is/are at the development stage, please indicate the phase, and when a copy will be provided to INFC.	

ER.4.4: Does the project (either in full or in part) require a provincial environmental assessment?	
Yes ☐	If not already provided, please provide copies of all reports related to the project. If the report(s) is/are at the development stage, please indicate when it/they will be completed and when a copy will be provided to INFC.
No ☑	This will be completed as part of the NIRB application process.

Aboriginal Consultation Part

This section contains a number of questions aimed at developing a better overview of the types of activities and/or work that will be carried out to determine the potential impact it could have on the Aboriginal or treaty rights of Aboriginal peoples. To determine whether the Crown conduct could have an adverse impact on established or potential Aboriginal or treaty rights, information must be compiled on those rights, which could include the right to hunt, fish, trap, gather and trade, and may either be established by a court or in a treaty, or may be asserted by an Aboriginal group, for example, in litigation or for the purpose of negotiating a treaty.

This step must be taken into consideration very early on in the process otherwise project delays can be expected if consultation is not completed satisfactorily or in a timely manner.

AC.1: Activities Related to the Project that could potentially impact Aboriginal rights. Examples of traditional Aboriginal activities can vary, and include gathering wild mushrooms and medicinal herbs on a river bank, fishing in a salmon river, hunting moose in the forest, and may involve ceremonial sites and former burial grounds. If one or more of the questions in this part are answered in the affirmative, please provide a description of the activity or activities in the last line of the table.		
Yes ☑	No ☐	Does the project involve works or activities on, under, over, through or across a water body such as a wetland, stream, river or lake? Check all that apply. **Fresh water:** ☐ Stream ☐ Lake ☐ Wetland ☐ River ☐ Pond ☐ Reservoir ☐ Active Floodplain ☐ Fish Bearing Watercourse **Coastal and Marine:** ☑ Beach ☐ Cove ☐ Mud Flat ☐ Salt Marsh ☑ Bay ☐ Exposed

		Coastline ☐ Estuary ☑ Fish Bearing Watercourse **Other:** ☑ Please describe: *the locations of the cable coming to land may be included in one or more of the coastal and marine selections above*
Yes ☐	No ☑	Can the work proposed have upstream or downstream impacts (e.g. change in water or temperature level upstream that could result in positive or negative impacts downstream, change in the turbidity, etc.)?
Yes ☐	No ☑	Are there activities proposed that may affect aboriginal traditional activities. Check all activities that apply. ☐ Fishing (e.g., preventing access to a fishing area or work in a waterbody such as river, lake, stream, culverts) ☐ Hunting (e.g., preventing access to a hunting area or clearing of forest or other vegetation etc.) ☐ Gathering (e.g., preventing access to a gathering area or clearing of forest or other vegetation etc.) ☐ Other (e.g. work close to or preventing access to sites of cultural/historical/archeological/ceremonial significance near the project etc.)
Yes ☐	No ☑	Is the project (in full or in part) occurring on undisturbed or undeveloped land? *The locations where the cable comes to land are disturbed land*
Yes ☑	No ☐	Is any component of the proposed project located outside the existing infrastructure footprint (build up footprint)?
Yes ☐	No ☑	Are there any relevant project activities that might affect other aspects of the environment (e.g. increases sound and/or noise levels, creates barriers to or limits access to harvesting areas, adds runoff to a watercourse, involves excavation)?
If you answered "**yes**" to any of the above, please provide details. *The cable will be laid under sea and come to land at specific sites.*		

AC.2: Has another federal, provincial or territorial government entity indicated that Aboriginal consultation is required for this project?	
Yes ☐	Please specify.
No ☑	
Unknown ☐	

AC.3.1: Has the province (or territory) been in contact with any Aboriginal groups regarding this project?	
Yes ☐	Please provide a summary of the consultation activities completed to date. If available, please provide details such as if any concerns were raised by Aboriginal groups, the nature of the concerns raised, and include in an attachment any information that may be useful (e.g. consultation plan, consultation summary, contact information, letters, emails, public notices, and any other types of communications).
No ☑	*Will be conducted as part of NIRB*

AC.3.2: Have you been in contact or plan to contact any Aboriginal groups regarding this project?	
Yes ☑	Please provide a summary of the consultation activities completed to date. If available, please provide details such as if any concerns were raised by Aboriginal groups, the nature of the concerns raised, and include in an attachment any information that may be useful (e.g. consultation plan, consultation summary, contact information, letters, emails, public notices, and any other types of communications).

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	The aboriginal groups will be fully consulted during the NIRB process.
No ☐	

AC.4: Involvement of the Crown -
Other Federal or Provincial Departments or Agencies may be involved in the project (e.g., if a permit, authorization, land transfer agreement, lease, etc. is required), such as, but not limited to:
The purpose of this section is to identify if other federal or provincial departments or agencies may be undertaking Aboriginal consultation activities as a result of their involvement in the project (e.g., issuing a permit and/or authorization).

If other authorities are involved, it is important to identify them, and to describe their role, particularly if they have to issue or have issued a permit and/or authorization. This is necessary for a number of reasons: to avoid procedural duplication, to enable the coordinated actions of the various authorities involved and to avoid submitting unnecessary repetitive requests to the Aboriginal groups concerned.

The information provided about the authorities and their actual or potential involvement in the project will help INFC to confirm their collaboration as early on in the process as possible.

Yes ☑	No ☐	Unknown ☐	Fisheries and Oceans Canada (e.g. *Fisheries Act*)
Yes ☑	No ☐	Unknown ☐	Transport Canada (e.g. *Navigation Protection Act*)
Yes ☐	No ☐	Unknown ☑	Natural Resources Canada (e.g. *Explosives Act*)
Yes ☐	No ☐	Unknown ☑	Environment Canada (e.g. *Species at Risk Act, Migratory Birds Convention Act, Canadian Environmental Protection Act*)
Yes ☐	No ☑	Unknown ☐	Parks Canada Agency
Yes ☐	No ☐	Unknown ☑	Other departments (e.g. federal department, provincial department, funding department, …) If applicable, please identify the federal department or agency and approval required.

If you answered "**yes**" to any of the above, please describe the involvement of the identified department(s)/agency(s) in detail.

Please provide contact information for each department identified so INFC can coordinate with them to avoid delays and duplication.

These departments will be involved during the Nunavut Planning Commission and NIRB process.

AC.5: Provincial (or territorial) permits

Please list all provincial (or territorial) permits that will be required for the project.

Please provide contact information for each department already contacted so INFC can coordinate with them to avoid delays and duplication.

Permitting will be handled through the NIRB and Nunavut Planning Commission review

Declaration of Information

Please check boxes to acknowledge you understand and/or agree to the following statements:

☑ INFC may have a duty to consult and, where appropriate, accommodate aboriginal groups, when the Crown contemplates conduct (such as providing funding) that might adversely impact potential or established Aboriginal or Treaty rights. INFC will rely to the extent possible on other processes that included Aboriginal consultation (e.g., a provincial environmental assessment process). However, it is understood that INFC may delegate certain procedural responsibilities to the proponent and the proponent will assist or carry out various aspects of consultation (e.g., the gathering of information).

☑ It is understood that INFC may not enter into a contribution agreement or the contribution may be conditional until such time as INFC has determined that its Aboriginal consultation obligations have been met.

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☑ I hereby certify that the information provided is accurate to the best of my knowledge and I understand that inaccurate information may result in the requirement for additional environmental and/or aboriginal consultation review.

Questionnaire completed by:
__Linda Casson________________

Signature: [redacted]

Date: September 5, 2018

Additional Links

Complete versions of the various acts outlined in this document please copy and paste these links into your browser.

- ***Oceans Act***-http://laws-lois.justice.gc.ca/PDF/O-2.4.pdf
- ***Wild Life Regulation***-http://laws-lois.justice.gc.ca/PDF/O-2.4.pdf
- ***Migratory Bird Sanctuary***-http://laws-lois.justice.gc.ca/PDF/C.R.C.,_c._1036.pdf
- ***Regulations Designating Physical Activities***-http://laws-lois.justice.gc.ca/PDF/C.R.C.,_c._1036.pdf
- ***Prescribed Information for the Description of a Designated Project Regulations***- http://laws-lois.justice.gc.ca/PDF/SOR-2012-148.pdf

ATIA - 14

ATIA - 16(2)

ATIA - 21(1)(b)

AGENDA

Undersea Fibre Optic Cable Installation
Project Discussion

December 19, 2018
10:00 a.m. to 10:30 a.m. EST

Teleconference: 1 877-413-4792 Conference ID: [redacted]

Attendance:

INFC:	Fariya Syed, Director North/Atlantic Stephen Passy, North Manager Rebecca Swedlove, Senior Program Analyst
Nunavut:	Tim Brown, Director Linda Casson, Manager

1. Introductions
2. Review of agenda
3. Updates
4. [redacted]
5.
6.
7.
8.
9.
10.
11.
12. Next Steps

ATIA - 16(2)

ATIA - 14

ATIA - 21(1)(b)

AGENDA

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Project Discussion

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Attendance:

INFC: Fariya Syed, Director North/Atlantic
Stephen Passy, North Manager
Rebecca Swedlove, Senior Program Analyst

Nunavut: Tim Brown, Director
Linda Casson, Manager

1. Introductions
2. Review of agenda
3. Updates

[redacted]

Pages 11-12
are withheld
pursuant to paragraphs
14 & 21(1)(b)
of the *Access to Information Act*

****

Les pages 11-12
Font l'objet d'une exception totale
conformément aux dispositions des
paragraphes
14 & 21(1)(b)
de la *loi sur l'accès à l'information*

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Trottier-Abbott, Catherine (INFC)

From: Trottier-Abbott, Catherine (INFC)
Sent: December 20, 2018 11:53 AM
To: Casson, Linda
Cc: Passy, Stephen (INFC); Swedlove, Rebecca (INFC)
Subject: RE: Fibre optic cable project

Hi Linda,
Thank you for providing the requested information so quickly, it is much appreciated.
I will let you know if I have any additional questions.
Best and happy holidays,
Kate

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: December-19-18 3:01 PM
To: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Cc: Passy, Stephen (INFC) <stephen.passy@canada.ca>; Swedlove, Rebecca (INFC) <rebecca.swedlove@canada.ca>
Subject: FW: Fibre optic cable project

Hi Catherine
Here are answers back to the environmental questions. I hope I caught all of the ones you needed. Please let me know if you need anything further.
I sent the larger list of questions to the consultant as well and hope to have the info the steering committee requested by tomorrow.

Linda

From: Bouchard, Jean-Francois
Sent: December 19, 2018 2:55 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: Wells, Dean <Dean.Wells@gov.nu.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>; Hickey, Ted <Ted.Hickey@gov.nu.ca>[redacted]
Subject: RE: Fibre optic cable project

Hi Linda,

Please find the answers to your questions below:

[redacted]

Page 14
is withheld
pursuant to paragraphs
14 & 21(1)(b)
of the *Access to Information Act*

****

La page 14
Font l'objet d'une exception totale
conformément aux dispositions des
paragraphes
14 & 21(1)(b)
de la *loi sur l'accès à l'information*

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From: Hickey, Ted <Ted.Hickey@gov.nu.ca>
Sent: Wednesday, December 19, 2018 2:05 PM
To: Casson, Linda <LCasson@GOV.NU.CA>[redacted]
Cc: Bouchard, Jean-Francois <JBouchard@GOV.NU.CA>; Wells, Dean <Dean.Wells@gov.nu.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: Fibre optic cable project
Importance: High

Thanks Linda,

JF would you be able to compile the answers to these six questions. The majority these I believe you have the most familiarity with. If you require assistance, please work with Hector for the areas where you need further details.

Keep in mind that Linda needs these answers by end of day tomorrow, so we can have them completed by noon tomorrow that would be great in case we need to make any changes.

Ted

From: Casson, Linda
Sent: December 19, 2018 1:37 PM
To: Hickey, Ted <Ted.Hickey@gov.nu.ca>[redacted]
Cc: Bouchard, Jean-Francois <JBouchard@GOV.NU.CA>; Wells, Dean <Dean.Wells@gov.nu.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: Fibre optic cable project

Thank you, Ted
A standing committee was struck by INFC to regularly meet with CGS and address issues. The meeting this morning was the first and immediately it was obvious that the structure needs to change. Going forward, the project steering committee will meet regularly, likely weekly for the first few months, to quickly identify areas needing more information and ensure the flow of information to INFC is expedited. A director-level committee may be established if needed.

I have attached the agenda for today and we can expect that updates on these standing items will be required at every meeting. It would very much expedite the process in the future to have a subject matter expert for the project on the call.

I can send the general questions but I think that a conference call would be the quickest and most efficient way for me to provide the context of the questions so no time is wasted on supplying information not needed. The amount of time I would need to fully write out the background of the question, the context and the nuance of the question could be more effectively used in a call.

I will send the remainder of the questions shortly but the following information is required by tomorrow close of business at the latest.

[redacted]

Thank you, and now I'll start packaging the other information requests.

From: Hickey, Ted
Sent: December 19, 2018 11:35 AM
To: Casson, Linda <LCasson@GOV.NU.CA>[redacted]
Cc: Bouchard, Jean-Francois <JBouchard@GOV.NU.CA>; Wells, Dean <Dean.Wells@gov.nu.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: Fibre optic cable project

Hi Linda,

Can you please send the questions to all four of us. From that point we will be able to determine who will be responsible for consolidating the answers.

Ted

From: Casson, Linda
Sent: December 19, 2018 11:30 AM
To: Hickey, Ted <Ted.Hickey@gov.nu.ca>[redacted]
Cc: Bouchard, Jean-Francois <JBouchard@GOV.NU.CA>; Wells, Dean <Dean.Wells@gov.nu.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: Fibre optic cable project

Good day, gentlemen:

I am starting to receive requests for additional information from INFC on technical, environmental assessment, routing, relationship with larger EAUFON project, etc.

Who is my go-to person for confirming and providing this additional information?

For several of the questions, I must have the responses sent in by Friday.

I am keeping a consolidated list of questions which I can provide at any time if you are interested in the type and range of questions.

Qujannamiik/Merci/Thank You

Linda Casson

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Manager, Infrastructure Programs
Department of Community and Government Services
Government of Nunavut

Atanguyaq, Nunalaaniituni
Tunngavikhaliqiyunut
Nunalingni Kavamatkunnilu
Pivikhaqautikkut
Nunavut Kavamanga

Gestionnaire, programmes d'Infrastructure
Ministère des Services communautaires et gouvernementaux,
Gouvernement du Nunavut

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

Infrastructure Canada

ICIP: ABORIGINAL CONSULTATION (AC) & ENVIRONMENTAL ASSESSMENT (EA) SMART FORM

As part of the application process for funding, applicants are required to complete the following smart form to determine if there are any federal environmental assessments requirements (Northern EA Regimes, Modern Treaties, Canadian Environmental Assessment Act, 2012) that could apply to the project. In addition, the information provided will also be used by INFC to determine if there is a requirement to consult with Indigenous Groups. This requirement may already be met by early engagement with Indigenous groups.

For questions, please contact us by email at the following address:
INFC.AboriginalConsultEnv-Consultautochtonesenv.INFC@canada.ca

*Fields marked with an * are required.*

General Information

P/T Project ID: tbc

Project Title*: Undersea Fibre Optic Cable Installation Linking Greenland, Nunavut and Quebec

Recipient Name*: Community and Government Services, Gov't of Nunavut

Primary Contact for Person Completing the Questionnaire

First Name*: Linda   Last Name*: Casson

☐ I am the project manager. If not, please add contact.

Address*: Box 1000   City*: Iqaluit

Postal Code*: X0A 0H0   Phone Number*: (867) 975-5336   Email*: lcasson@gov.nu.ca

Add Contact

Excluded Projects (note: not applicable to water or wastewater projects)

My project exclusively involves one of the following:

☐ The installation or modification of equipment (e.g., mechanical generator or pump) in an existing building that is not on federal lands.

☐ The purchase of rolling stock.

☐ The installation of bus shelters in an urban area that is not on federal lands and not near a fish-bearing watercourse (note: picture required)

☐ Modifications* to an existing building that is not on federal lands. (*Does not include expansions)

☒ N/A

EA and AC Determination

Please select a Province/Territory:*: Nunavut

Does a Modern Treaty, Self-Government Agreement or Northern EA Regime apply to the Project area? Select all that apply*

☒ Nunavut Land Claim Agreement(NLCA)

☐ N/A

Version 3.0 / Last Modified: 2018/09/27

Canada

Describe types of land ownership in the project area? (Check all that apply)*

- ☐ Federal
- ☒ Provincial/Territorial
- ☒ Municipal
- ☐ Private
- ☒ Other (i.e. Indigenous or other level of government)

Please specify:* Inuit Lands

Is the project a designated project according to the *Regulations Designating Physical Activities*?*

No

Is any part of the project located in whole or part on land potentially contaminated by previous activities?*

Unknown

Aboriginal Engagement

Have Aboriginal groups been notified about the project?*

Yes

Early Engagement Has Occured

Did you base your decision on groups to consult on guidance/advice provided by INFC?*

No

Please include in the attached documents: a consultation record (definition will be provided), incoming letters of support (if available) and an example of the outgoing information to Aboriginal groups.

Which aboriginal groups have been notified? List all groups:*

Group	
QIA	+ -
NTI	+ -
	+ -

Have concerns been raised?*

No

Please confirm how you attempted to retrieve feedback:*

A letter was sent to all Inuit organizations in the spring. For use of Inuit Land, NTC provides forms to complete. This process is underway. The NIRB review will be launching in December

What is the nature of the project? (Check all that apply).*

- ☐ Rehabilitation
- ☐ Expansion
- ☒ New Construction (includes re-building)
- ☐ Other

Federal, Provincial, Territorial Involvement

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Please indicate all Federal Departments or agencies that may be involved in the project. (Check all that apply)*

☒ Fisheries and Oceans Canada(e.g., Fisheries Act)

First Name	George
Last Name	Schlagintweit
Phone Number	905-336-4857
Email	George.Schlagintweit@dfo-mpo.gc.

☐ Transport Canada (e.g., Navigation Protection Act)

☐ Environment Canada (e.g., Species at Risk Act, Migratory Birds Convention Act, Canadian Environmental Protection Act)

☐ Parks Canada Agency

☐ Natural Resources Canada (e.g., Explosives Act)

☐ N/A

☒ Other Department

Please specify the federal department or agency and approval required:*

Department	Permit	Statute	
Industry Canada	International Submarine Cable licence	Telecommunications Act, International Submarine Cable Licences Regulations	+ -
AANDC			+ -

Please list all provincial or territorial environmental permits that could or might be required for the project.

Permitting will be handled through the NIRB and Nunavut Planning Commission Review by end of Dec	+ -
	+ -

Does the Project require a Provincial Environmental Assessment?*

Yes

Has another federal, provincial or territorial entity indicated that Aboriginal consultation is required for the project?*

No

Infrastructure
Canada

DECLARATION OF INFORMATION

Please check the box to acknowledge you understand and agree to the following statements:

☒ INFC strongly encourages early engagement with Aboriginal groups since establishing relationships with Aboriginal groups in advance of pursuing developments of specific projects has proven to be an effective management practice (e. g., most effective way to avoid project delays). INFC may have a duty to consult and, where appropriate, accommodate aboriginal groups, when the Crown contemplates conduct (such as providing funding) that might adversely impact potential or established Aboriginal or Treaty rights. INFC will not delegate this duty but may rely, to the extent possible, on the information collected as part of other processes that include Aboriginal engagement and consultation (e.g., proponent led engagement activities, provincial environmental assessment process, etc.). Given a proponent's knowledge of any participation in project activities, INFC will also rely on assistance from proponents in carrying out various aspects of engagement and consultation activities. For example, INFC may request that proponents give notice of their projects, hold meetings, gather and share information, and develop and implement measures to address potential impacts on Aboriginal and treaty rights as well as on the interests of Indigenous groups.*

Please attach consultation record (if applicable) when submitting form electronically. (32 MB)

Form completed by:* Linda Casson

Date completed (DD/MM/YYYY):* 28/11/2018

Completed forms should be sent to the sender.

Save | Submit by Email | Reset

Canada

Trottier-Abbott, Catherine (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: December 20, 2018 4:57 PM
To: Trottier-Abbott, Catherine (INFC); Swedlove, Rebecca (INFC)
Subject: FW: NIRB 125425 / 18UN050: Project Application Acceptance Confirmation for GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

Further information on NIRB application.
Linda

From: Bouchard, Jean-Francois
Sent: December 20, 2018 4:19 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: FW: NIRB 125425 / 18UN050: Project Application Acceptance Confirmation for GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

FYI

From: NIRB Enterprise Management System <noreply@nirb.ca>
Date: Thursday, Dec 20, 2018, 4:16 PM
To: info@nirb.ca <info@nirb.ca>
Subject: NIRB 125425 / 18UN050: Project Application Acceptance Confirmation for GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

20-Dec-2018

Dear Jean-Francois Bouchard,

Your project application No. 125425 was accepted for screening and has been assigned NIRB file No. 18UN050.

You will be notified by email on the further progress of your application.

Best regards,

Cassel Kapolak
Environmental Administrator

Nunavut Impact Review Board
29 Mitik Street
P.O. Box 1360
Cambridge Bay
NU, X0B 0C0 Canada
Phone: (867) 983-4600
Toll Free: 1-866-233-3033
Fax: (867) 983-2594
Email: info@nirb.ca
Web: www.nirb.ca

This is a system generated email.
Please do not respond to this message.

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ATIA - 19(1)

Trottier-Abbott, Catherine (INFC)

From:	Casson, Linda <LCasson@GOV.NU.CA>
Sent:	December 20, 2018 5:38 PM
To:	Passy, Stephen (INFC); Swedlove, Rebecca (INFC); Trottier-Abbott, Catherine (INFC)
Subject:	Notes and to do items from Dec 19th
Attachments:	Agenda, Notes December 19 2018.docx; Fibre Optic Project - Dec 19 - Questions.docx
Follow Up Flag:	Flag for follow up
Flag Status:	Completed

Hi all

[redacted]

And since it has been that kind of day, I may have already sent this, and if that is the case….my deepest apologies.

Linda

ATIA - 16(2)
65

ATIA - 14

ATIA - 21(1)(b)

AGENDA and Notes

Undersea Fibre Optic Cable Installation
Project Discussion

December 19, 2018
10:00 a.m. to 10:30 a.m. EST

Teleconference: 1 877-413-4792 Conference ID: [redacted]

Attendance:

INFC: ~~Fariya Syed, Director North/Atlantic~~ - Regrets
Stephen Passy, North Manager
Rebecca Swedlove, Senior Program Analyst

Nunavut: ~~Tim Brown, Director~~ Regrets
Linda Casson, Manager

- Introductions
- Review of agenda
- Updates -

[redacted]

Page 26
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pursuant to paragraphs
13(1)(c), 14 & 21(1)(b)
of the *Access to Information Act*

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paragraphes
13(1)(c), 14 & 21(1)(b)
de la *loi sur l'accès à l'information*

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ATIA - 14

ATIA - 21(1)(b)

Fibre Optic Project Steering Committee
Dec 19, 2018

List of questions

[redacted]

Page 29
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pursuant to paragraphs
14 & 21(1)(b)
of the *Access to Information Act*

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paragraphes
14 & 21(1)(b)
de la *loi sur l'accès à l'information*

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ATIA - 19(1)

Trottier-Abbott, Catherine (INFC)

From:	Swedlove, Rebecca (INFC)
Sent:	December 21, 2018 11:12 AM
To:	Trottier-Abbott, Catherine (INFC)
Subject:	FW: Steering Committee 19 Dec Questions answer 2 International Aspects
Attachments:	Steering Committee 19 Dec Questions answer 2 International Aspects.docx
Follow Up Flag:	Follow up
Flag Status:	Completed

Hi Kate,

I received this from Linda. It references environmental aspects so I thought I should share with you.

Thanks,
Rebecca

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: December 21, 2018 10:50 AM
To: Swedlove, Rebecca (INFC) <rebecca.swedlove@canada.ca>
Subject: Steering Committee 19 Dec Questions answer 2 International Aspects

Here is the next batch of answers. I know the wording and grammar is a bit shaky but with the time lines, I hoped the message would be clear. [redacted]

Linda

Pages 31-32
are withheld
pursuant to paragraphs
13(1)(c) & 14
of the *Access to Information Act*

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Les pages 31-32
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conformément aux dispositions des
paragraphes
13(1)(c) & 14
de la *loi sur l’accès à l’information*

Trottier-Abbott, Catherine (INFC)

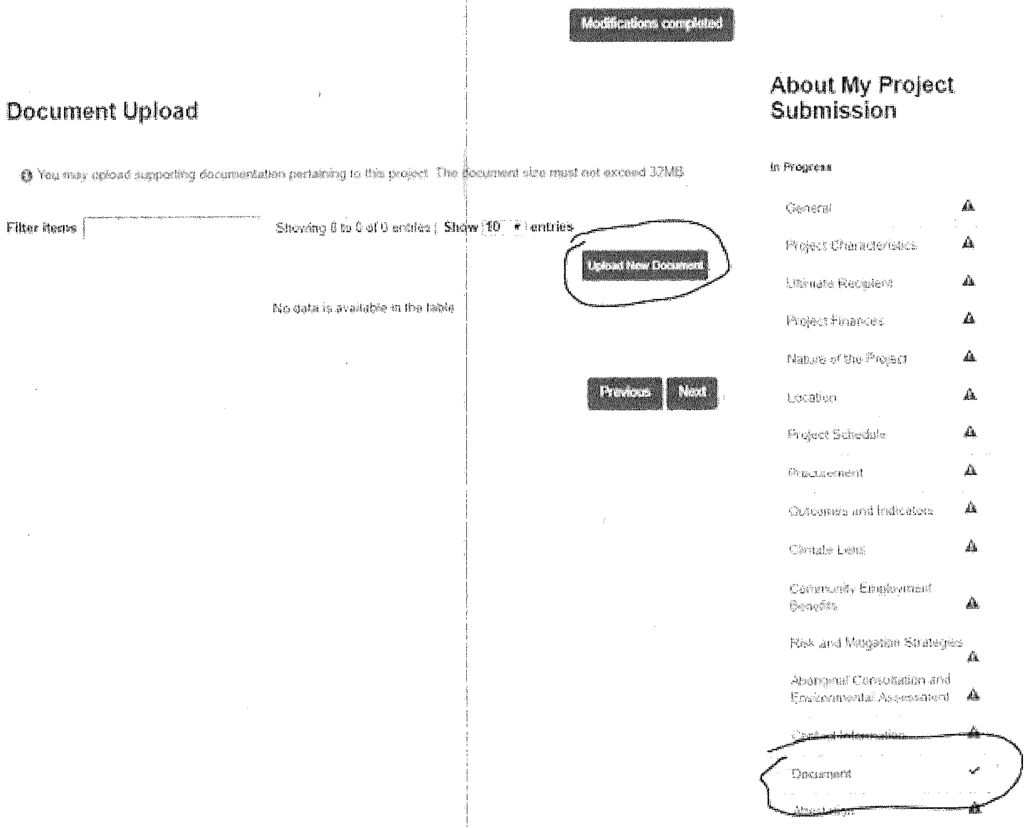
From:	Trottier-Abbott, Catherine (INFC)
Sent:	December 27, 2018 9:48 AM
To:	Casson, Linda; Hartwick, Darcy (INFC)
Subject:	FW: NIRB update for Fibre Project

Thanks Darcy. ☺
Linda: please see the response below regarding your question on uploading documents.
Best,
Kate

From: Hartwick, Darcy (INFC)
Sent: December-27-18 9:38 AM
To: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Subject: RE: NIRB update for Fibre Project

Good morning Kate,

Yes this feature exists and should be pretty intuitive. See screenshot below. Click "document" from the navigation tab then "upload new document". From there you enter a description of the document and then "choose file" from your drive and click save.



From: Trottier-Abbott, Catherine (INFC)
Sent: December 21, 2018 1:47 PM
To: Hartwick, Darcy (INFC) <darcy.hartwick@canada.ca>
Subject: FW: NIRB update for Fibre Project

Hi Darcy,
Do you mind letting me know if P/Ts can upload documents to IRIS yet? Nunavut is having some trouble doing so for an ICIP project.
Thanks,
Kate

From: Trottier-Abbott, Catherine (INFC)
Sent: December-20-18 2:31 PM
To: 'Casson, Linda' <LCasson@GOV.NU.CA>
Subject: RE: NIRB update for Fibre Project

It might not have the functionality to do this yet, but eventually it should. I will ask our IRIS folks for input.

Thanks,
Kate

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: December-20-18 2:19 PM
To: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Subject: RE: NIRB update for Fibre Project

I tried to save this to IRIS and I don't seem to be able to save additional documents or emails. Perhaps the system doesn't have this option?

From: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Sent: December 20, 2018 2:15 PM
To: Casson, Linda <LCasson@GOV.NU.CA>; Swedlove, Rebecca (INFC) <rebecca.swedlove@canada.ca>
Subject: RE: NIRB update for Fibre Project

Thanks Linda!

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: December-20-18 2:12 PM
To: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>; Swedlove, Rebecca (INFC) <rebecca.swedlove@canada.ca>
Subject: FW: NIRB update for Fibre Project

Latest update on NIRB and NHC process.

Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: Bouchard, Jean-Francois
Sent: December 20, 2018 1:05 PM
To: Hickey, Ted <Ted.Hickey@gov.nu.ca>; [redacted]
Cc: Casson, Linda <LCasson@GOV.NU.CA>
Subject: NIRB update

All,

Project has been submitted to NIRB after a pre validation over the phone.

NIRB will perform a completeness check of the application and will begin the process. Same as for NPC, there is a chance that they will return the application for clarification or additional detail/information.

Hector please update tasker's - **NIRB % completeness to 20%.**

60

BR,

JF Bouchard

4

Trottier-Abbott, Catherine (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: January 7, 2019 10:15 AM
To: Trottier-Abbott, Catherine (INFC)
Subject: RE: Indigenous Consulation
Attachments: NULTIP - Final Draft - January 4 19 Final to Canada.pdf

Hi Kate!
Hope you had a great holiday!
I've attached the infrastructure plan that was approved by our Financial management board. We are continuing the engagement to refine the list of projects for June.

Note that the abbreviation for Government of Nunavut is GN.. [redacted]

Please let me know if you need anything further.

Linda
Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Sent: January 2, 2019 2:56 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: RE: Indigenous Consulation

Hi Linda and Happy New Year!

I'm preparing a note to NTI on INFC's consultation approach in Nunavut and how we mostly rely on the NIRB's process. I would also like to provide an overview of ICIP and the kinds of projects likely to be funded under it in NU.

Would you mind giving an update on the GNU's priorities with respect to ICIP?

Thanks,
Kate

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: October-12-18 3:20 PM
To: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Subject: RE: Indigenous Consulation

We had winds of 140 km and the GN was shut down. The meeting has been rescheduled for Oct 19th. I've attached the draft agenda for your info..

Linda

From: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Sent: October 12, 2018 3:00 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: Indigenous Consulation

Hi Linda,
I hope you are well. When you have a chance, would you mind sharing information from your meeting with the capital planners?
Many thanks,
Catherine

From: Trottier-Abbott, Catherine (INFC)
Sent: September-28-18 9:50 AM
To: 'Casson, Linda' <LCasson@GOV.NU.CA>
Cc: Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: Indigenous Consulation

Great! Thanks Linda for confirming.

Catherine

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: September-27-18 3:08 PM
To: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Cc: Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: Indigenous Consulation

Hi Catherine
Thanks for this and i believe we will have a good sense of the types of projects after our meeting of capital planners on Oct 5. Of course fibre will be a big project under rural and northern and powerplants will completely use up the arctic energy fund.

Linda

Sent with BlackBerry Work (www.blackberry.com)

From: "Trottier-Abbott, Catherine (INFC)" <catherine.trottier-abbott@canada.ca>
Sent: Sep 27, 2018 3:47 PM

(30)

To: "Casson, Linda" <LCasson@GOV.NU.CA>
Cc: "Brown, Tim" <Tim.Brown@GOV.NU.CA>
Subject: RE: Indigenous Consulation

ATIA - 19(1)

Hi again Linda,

[redacted] but I wanted to ask if you'd be able to confirm or provide a sense of the project type priorities in Nunavut that are likely to come forward under ICIP. You had previously mentioned water and wastewater treatment projects, but if other types have been identified, it would be helpful to know since we are trying to finalize our Smart Form. Would you mind confirming in the next couple of weeks, say October 11th?

As an FYI, we're working to streamline the smart form by adding an exclusion section, specifically for projects exempted under the Schedule 12.1 of the NLCA. But before we can do this, we need a better sense of the kinds of projects that will come forward first and if they would be exempted. I think it would also be worthwhile to communicate our exclusion approach with the NTI along with some examples, in order to confirm if they have any issues with this approach. Would you or Tim mind if I shared the GNU's priorities with them in this context?

Thanks again,
Catherine

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: September-27-18 11:03 AM
To: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Cc: Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: Indigenous Consulation

Hi Catherine
[redacted] but have sent your request to Tim.

Sent with BlackBerry Work (www.blackberry.com)

From: "Trottier-Abbott, Catherine (INFC)" <catherine.trottier-abbott@canada.ca>
Sent: Sep 27, 2018 11:18 AM
To: "Casson, Linda" <LCasson@GOV.NU.CA>
Cc: "Robbins, Laura (INFC)" <laura.robbins@canada.ca>
Subject: RE: Indigenous Consulation

Thanks Linda, would you have any advice on a contact at the NTI? I'd also like to hear their perspective on the consultation process undertaken by the NIRB.

Catherine

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: September-05-18 2:40 PM
To: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Cc: Robbins, Laura (INFC) <laura.robbins@canada.ca>
Subject: FW: Indigenous Consulation

Hi Catherine

(31)

The contact person at AANDC re consultation is Marie Saikaley. Her coordinates are below

All the best

Linda

From: Allain, Erik (AADNC/AANDC) <erik.allain@canada.ca>
Sent: September 5, 2018 2:26 PM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>
Cc: Saikaley, Marie (AADNC/AANDC) <marie.saikaley@canada.ca>
Subject: Indigenous Consulation

Hi Tim,

To follow up on your inquiry regarding Indigenous Consultation, the go to person for our Department is Marie Saikaley. I contacted Marie and informed her you may contact her for details on our consultation process so feel free to reach out to her at your convenience.

Let me know if I can help with anything else,

Regards,

Marie Saikaley

Telephone :
819-635-4854
Fax :
819-934-1983
Email : marie.saikaley@canada.ca

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Erik Allain

Director of Lands, Nunavut Region
Crown-Indigenous Relations and Northern Affairs Canada
erik.allain@canada.ca / Tel: 867-975-4295

Directeur des Terres, Région du Nunavut
Relations Couronne-Autochtones et Affaires du Nord Canada
erik.allain@canada.ca / Tel: 867-975-4295

Infrastructure Planning Session – Facilitator's Guide

Hospitality Services: **9:00** **Coffee service**

12:00 **Soup, salads, sandwiches and desserts, coffee service**

2:00 **Coffee service refreshed**

Morning Session

	Activity	**Facilitation/ Lead**	**Logistics**
8:30 – 9:00	Registration		
9:00 – 9:10	Welcome and Introductions	Tim	Any other opening remarks?
9:10 – 9:30	Recap of Funding Structure and Reporting Requirements	Tim	Tim – we can fine tune your presentation on Thurs if you want you can do a dry run with us Need to hand out slides? presentation re funding / reporting, including timeline map of when key reports are due, when work will start, when it has to end etc. (JW can help finalize these slides on Thursday) AND … *Tim to speak to urgent water and solid waste needs (and price tag) and that this meeting is to discuss how the remaining funds will be prioritized across GN needs. Show existing timeline and that we want to identify additional projects worth up to $120M*
	Introduction of process for the morning	Jennifer	
9:30 – 10:30	Identifying Strategic Priorities in Nunavut under each ICIP Stream – World Café	Jennifer	Need 4 world café hosts (one for each theme) and one time-keeper / facilitator Need flip charts and markers for each station Can we colour code the themes? Green, Red, Blue, Black Markers at that station in that colour, and the dots correspond to that colour. Will help keep concepts separate. Need facilitator guide or key points for participants at each station. Participants to rotate between stations (one for each theme) • Green Infrastructure • Communities, Culture & Recreation Infrastructure • Rural and Northern Communities Infrastructure • Arctic Energy Fund

			Participants will generate key priorities and strategic considerations that will help identify the most important projects under each theme.
10:30-10:45	Break		Has coffee been ordered?
10:45 – 11:00	Recap of priorities by theme that have been identified.	Jennifer	
11:00 – 12:00	Interdepartmental Presentations of infrastructure needs / priorities (5-7 minutes per Department)	Jennifer	Need flip chart paper for each theme – Write projects large enough and with space between for people to post dots and other notes. As each project is described, we post it under one of the themes, and also note its linkages to Turaaqtavut and TRC (maybe coloured stickies for Turaaqtavut and TRC?).
12:00 – 1:00	Working Lunch – Lunch provided THE MUNICIPAL INFRASTRUCTURE PLANNING PROCESS (ICIP)	Tim/Jennifer	Has lunch been ordered? Leave 15 minutes for a bio break, and people to get plates etc - then ppt presentation
1:00 – 2:30	Interdepartmental presentations continued.		
2:30 – 3:15	Identifying areas of synergy / collaboration	Jennifer	Officials circulate to the project lists and post a sticker with their department's name on projects where there may be synergies / collaboration / multi-purpose infrastructure opportunities. Then back to seats and plenary review of outcomes by theme
3:15 – 3:30 -	Break		Has coffee been ordered?
3:30 – 4:15	Your perspective on which projects are the most important for Nunavut	Jennifer	Dotmocracy What would be the best for NU? If we could only fund 5 from each stream which ones would be best for NU. Give them 5 dots of 4 different colours – one colour for each theme. After dots, back to seats and plenary review by theme.
4:15 – 4:30	Next Steps & Wrap-Up	Tim	– what's next – what reports will be generated, how will more senior officials and Inuit orgs be briefed, when / how will final projects be identified?

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Building Nunavut Together
Nunavuliuqatigiingniq
Bâtir le Nunavut ensemble

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Nunavut

Nunavut's Long Term Infrastructure Plan 2018

FOR THE DELIVERY OF THE
INVESTING IN CANADA
INFRASTRUCTURE PROGRAM

GOVERNMENT OF NUNAVUT | Box 1000, STN 700, Iqaluit, NU, X0A 0H0

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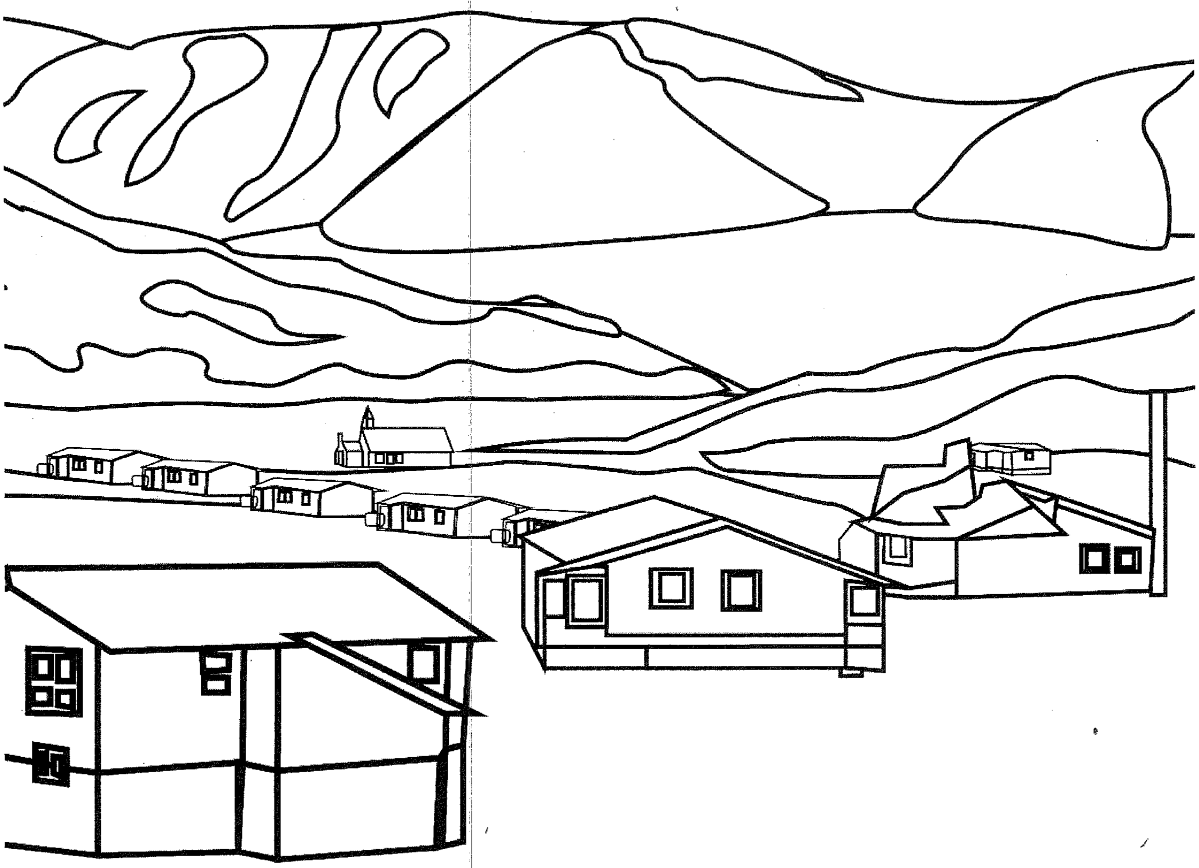

Table of Contents

Nunavut's Infrastructure

CONTEXT:

Nunavut's infrastructure pressures, while similar to the rest of Canada, present a more complex challenge than in other jurisdictions given its geography, climate, history and demographics. Providing infrastructure to Nunavut's communities is a daunting task – vast distances, growing populations, high construction costs and the inability to share services between neighbouring municipalities are all constraints. This creates challenges when providing infrastructure that supports the social, cultural, environmental and economic needs of communities.

Nunavut's population, approximately 37,082 (See Appendix A for Census Data) is distributed among 25 communities set in an arctic landscape that spans 20% of the Canadian land mass. The population has grown nearly 40% since the creation of the territory in 1999. It will continue to increase given that 30% of the population is under 15 years of age.

All communities have aging public buildings and a legacy of issues with infrastructure either inherited from the Northwest Territories in 1999 or constructed as part of the implementation of the 1993 *Nunavut Land Claims Agreement* (NLCA). In many cases, buildings are well past their expected service lives. The Territory faces increasing needs across every critical infrastructure category, each competing for very limited capital resources. Whether with marine or air transportation, essential services (water, wastewater, solid waste), roads, energy, telecommunications, municipal and safety services, Nunavut's infrastructure deficit is painfully evident in every community across the Territory.

This infrastructure deficit amplifies a wider range of complex, interrelated factors that negatively affect the health and wellbeing of Nunavummiut. Caught between competing critical infrastructure needs, Nunavut's ability to address its widening social infrastructure gap continues to decline. Residents generally face higher incidences of communicable diseases, higher suicide rates, greater food insecurity, greater poverty, lower educational attainment, more-prevalent substance abuse and addiction, escalating instances of absolute homelessness and chronic housing overcrowding.

Fortunately, over the two decades of its existence, Nunavut's infrastructure needs were mitigated in some areas. This is due in large part to a steady pattern of federal infrastructure investment programs that have evolved not just in size, but also in the sophistication of program objectives, structure, and administration to inject much needed incremental infrastructure funding.

Part 1: Approach and Priorities

Although there is more to be done, the *Investing in Canada's Infrastructure Program* (ICIP) represents a culmination in the evolution of federal infrastructure funding programs. With a host of features that go beyond previous funding programs, the ICIP is inspirational in the breadth of its scope. There are however, challenges around ICIP objectives and reporting requirements that will strain the capacity of a unique jurisdiction like Nunavut.

The inclusion of an *Environmental Quality* envelope within the ICIP Green Infrastructure funding stream, the creation of an Arctic Energy Fund, and the *Truth and Reconciliation Commission Recommendation* caveat in the Rural and Northern Communities funding stream are evidence of a better understanding at the federal level. There has been careful consideration given to the unique realities faced by jurisdictions with significant rural, northern and indigenous populations, such as Nunavut.

Nunavut's governmental capacity will need additional capacity to ensure its ability to participate in every dimension of ICIP and make meaningful contributions to meet and comply with all program requirements.

Balancing Municipal and Territorial Needs

The Government of Nunavut (GN) annual capital planning process aligns with the administration and delivery objectives of ICIP. The process provides a balance of municipal and territorial projects with each capital estimate cycle.

Reaching an appropriate balance is dependent on continued participation of both the Territorial- and Municipal governments in the *Integrated Community Sustainable Plan* (ICSP) system, developed in 2005, for the implementation and distribution Gas Tax funding.

Throughout this process, the GN works with each community, primarily through its Department of Community and Government Services (CGS), to help communities define and bridge their infrastructure gaps. Communities self-identify and rank their priorities for infrastructure needs and submit an infrastructure plan to CGS as part of their ICSP.

CGS supports municipal infrastructure projects through the GN's annual capital planning process, which ensures that critical infrastructure gaps are identified, priority projects are brought to the forefront and essential infrastructure is provided to the recipient community. See Appendix B: ICIP Project Selection Process.

In order to determine Territorial priorities, CGS facilitated a whole-of-government engagement process that involved:

- An initial canvassing of departmental priorities in anticipation of the federal announcement of Phase 2 funding

- Face-to-face meetings with senior management in each department and agency to review the ICIP program when the details of the program became available from Infrastructure Canada
- Two final rounds of interdepartmental engagement with senior management in the Fall of 2018, to confirm preliminary GN priorities.

Tracking ICIP Projects

Management of ICIP projects will be achieved by using the same systems that is in place for reporting on other federal funding programs, such as the Clean Water and Wastewater Fund (CWWF), the Small Community Fund (SCF) and the National Regional Program (NRP). The GN uses E-Builder software for managing all of its capital projects.

The GN recognizes that the volume and scope of ICIP projects will require enhancements to this software system to ensure better integration with the GN financial system and to improve the timely collection of information in its tracking process for multi-year projects. The GN has included the E-Builder enhancements in its business case for administration funding.

Engagement with Inuit Organizations

Article 32 of the NLCA commits the GN to provide Inuit with the opportunity to participate in the development of social and cultural policies and programs, and the method of project design and delivery within the Nunavut settlement area. It further requires the GN to reflect Inuit goals and objectives when implementing the aforementioned social and cultural policies, programs, and services within the Nunavut settlement area.

Nunavut's indigenous context is unique in that First Nations reserves do not exist. The distinction between Inuit, Municipal and Territorial infrastructure needs has never been appropriately defined. The GN remains committed to meeting its obligations under Article 32, and acknowledges that the funding requirements under ICIP are prompting a deeper dialogue between the GN and Inuit Organizations regarding the Territorial infrastructure needs.

The ICIP requirement to ensure infrastructure projects respect the unique and wide-ranging needs of rural and northern communities. This includes the advancement of reconciliation with indigenous peoples and building community capacity needs to stimulate a more meaningful collaboration between infrastructure needs and its impact on program delivery in Nunavut.

Dialogue between the three Regional Inuit Associations (RIA), Nunavut Tunngavik Incorporated (NTI), the Nunavut Association of Municipalities (NAM), the Nunavut Association of Municipal Administrators (NAMA) and the GN is critical to achieve improved coordination in the prioritization of projects. This will ultimately lead to more efficient and effective returns on federal infrastructure investments.

The GN is committed to a deeper, more comprehensive engagement process to bring each of these organizations together to build on joint initiatives, such as the Nunavut Economic Forum,

the Nunavut Roundtable for Poverty Reduction, and the Nunavut Food Security Coalition, with specific strategic objectives that could affect infrastructure-funding decisions.

This process will be ongoing and will ensure infrastructure projects respect the unique and wide-ranging needs of rural and northern communities, including advancement of reconciliation with Indigenous peoples and building community capacity needs.

Meeting National Targets under ICIP

With so many competing priorities, Nunavut must take a broader approach to meet the national targets set out in the Integrated Bilateral Agreements and for the prioritization of projects that support key actions identified as part of Nunavut's commitment under *the Pan-Canadian Framework on Clean Growth and Climate Change (the Pan-Canadian Framework).*

Nunavut is working towards meeting its commitments under the *Pan-Canadian Framework* through its contributions to the Low-Carbon Economy Funding Agreement. Nunavut is already progressing with the installation of 3 District Heating Systems, and the retrofitting of its aging Public Housing Portfolio. This fall, Nunavut is putting forward the South Baffin Energy Management Program, which is a major commercial retrofit program for all GN buildings in the six communities in the southern portion of Baffin Island. This project enhances the existing Nunavut and Kivalliq Energy Retrofit Programs in place for Iqaluit and the Kivalliq Region.

Through its project selection under the Arctic Energy Fund within the ICIP, Nunavut will meet its national targets for:

- Increasing the efficiency of electricity generation, defined as kilowatt hour per litre or cubic meter of fuel used, by four percent (4%) in communities that are dependent on fossil fuel for electricity generation, and
- Contributing to a national ten mega-tonne reduction of greenhouse gas emissions.

Through its project selection under the Green Infrastructure Fund within the ICIP, Nunavut will meet its national target to:

- Eliminate long-term drinking water advisories in non-reserve communities.

Nunavut will continue to implement the Nunavut Building Code in all ICIP projects to:

- Ensure 100% of federally funded, public-facing infrastructure meets the highest published, applicable accessibility standard in the respective jurisdictions.

And finally, through its project selection under the ICIP Rural and Northern funding stream, Nunavut anticipates being able to meet the national target for increasing between 5% and 7% the number of rural households that have access to the highest broadband speed available in Nunavut based on 2015 Canadian Radio-Television and Telecommunications Commission data.

Nunavut's capacity to have meaningful participation in implementing community employment benefits for federal target group will be limited at first. It will focus on Inuit employment and the

promotion of small and mid-sized businesses, and where possible on apprentices, through its Nunavummi Nangminiqaqtunik Ikajuuti (NNI) program with enhanced regulations in place and contracting clauses promoting the use of apprentices.

ICIP ADMINISTRATION FUNDING 2020-28

Table 2 - Updated fiscal year breakdown for administrative funding over the life of the program

Fiscal Year	Salaries ($)	Other Costs ($)	Total Administration Expenses ($)
2019-2020	517,041	95,000	612,041
2020-2021	654,984	245,000	899,984
2021-2022	663,767	95,000	758,767
2022-2023	672,724	95,000	767,724
2023-2024	681,772	145,000	826,772
2024-2025	691,000	145,000	836,000
2025-2026	279,826	145,000	424,826
2026-2027	141,790	145,000	286,790
2027-2028	107,764	147,000	254,764
Total	**$ 4,410,668**	**$ 1,257,000**	**$ 5,667,668**

Part 2: Infrastructure Priorities by ICIP Funding Stream

The GN's overarching mandate, *Turaaqtavut,* speaks directly to the priority of developing infrastructure and the economy in ways that support a positive future for Nunavummuit. This priority, *Pivaallirutivut,* hinges on striking a balance to manage and meet the specific outcomes of three ICIP streams in unison. This threefold approach will advance infrastructure in Nunavut.

The first focus will be on critical water, wastewater, solid waste and power facilities in the territory under the Green Infrastructure funding stream.

Secondly, it will provide dedicated spaces to address the health and wellness disparity among indigenous people by focusing on community infrastructure, such as community wellness hubs and cultural centers under the Community, Culture and Recreation Infrastructure funding stream.

Finally, it will establish strategic priorities for projects in support of truth and reconciliation commission recommendations, transportation, and economic development infrastructure under the Rural and Northern Infrastructure funding stream.

Green Infrastructure

Nunavut's priorities for infrastructure investments with the Green funding can be summarized as reliable access to clean drinking water, improved solid waste management, and environmentally safe wastewater treatment.

The GN wants to bring these areas of municipal infrastructure to a level that is in line with the rest of Canada, using technology that is appropriate for Nunavut. These priorities focus squarely on the Environmental Quality envelope. CGS, through its Local Government Branch, is working closely with GN partners and municipalities to develop three key strategies for drinking water, wastewater and solid waste for the Territory.

In doing so, Nunavut will be continuing its prioritization of these three essential municipal services within the scope of federal infrastructure funding programs. Although the prioritization of projects has shifted between these three services over the years, the focus for Green funding will be on supporting the GN's Drinking Water Strategy.

This will ensure all communities without an upgraded water treatment plant and storage are equipped to comply with impending new drinking water guidelines from the Department of Health. These projects will also build on the CWWF projects centered on the development of a WTP Operator Certification Project, and the standardization of the design of WTPs to support streamlined municipal operations

Increased access to potable water

Nunavut obtains its freshwater for domestic use from lakes and glacier melt. Water is pumped from the source to a water reservoir or directly to the Water Treatment Plant (WTP). For the majority of communities in Nunavut, treatment consists of chlorine injection at a truck fill station that is overseen by water-truck delivery drivers. This single barrier approach to treatment will no longer meet Canada's drinking water guidelines and territorial upgrades will be required.

CGS is currently working on a project that explores the benefits of standardizing the design of WTPs under the CWWF. This project will help develop the preliminary information for the proposed clean water projects under the Environmental Quality envelope of the green infrastructure stream.

The design concept under examination includes a combination of treated water storage tanks and a standardized multi-barrier treatment train with capacity for additional treatment equipment should unique water chemistry issues arise in communities. Boil water advisories have been an ongoing issue for several communities; this enhanced treatment strategy is expected to address the majority of these occurrences.

A WTP design with a uniform layout and identical equipment creates an opportunity for a Nunavut specific WTP operator training program. This will produce a territorial team of local staff that can be mobilized for operations and maintenance of WTPs as needed; ultimately decreasing reliance on southern labour. This will also allow for a reserve of replacement parts and equipment to be stockpiled to decrease delivery time and cost.

Increased capacity to reduce or remediate soil and air pollutants

Solid waste management in Nunavut could be described as unsorted garbage being deposited at a local dumpsite. The GN is currently upgrading 13 community dumpsites most in need of upgrading, converting them to engineered solid waste management facilities with funding under the Small Community Fund (SCF). Engineered landfill site designs, focus on lined cells, which prevent polluted water from re-entering the surrounding environment, for the segregation of each identified waste stream.

In addition to lined cells, these projects include proper storage for hazardous waste to contain this waste until it can be backhauled for proper disposal and additional space for anticipated waste diversion infrastructure in the future. Iqaluit's Solid Waste Management Project is currently Nunavut's only approved project under ICIP.

The average cost of a solid waste site upgrade is approximately $10 million per site. Given the priority on upgrading water treatment capacity across the Territory in anticipation of new drinking water regulations, Nunavut cannot afford to upgrade the remaining solid waste sites under the Green Environmental Quality envelope.

Further, from a strategic perspective Nunavut needs to complete its solid waste management strategy before upgrading the remaining sites to ensure they match future best practices. Once

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complete, the strategy will help the GN secure additional infrastructure funding to complete the upgrades of the remaining solid waste sites.

In the interim, the GN plans to reduce the volume of metal waste in every landfill across Nunavut. Communities repeatedly identified the accumulation of metal waste as a concern. In 2016, the GN agreed to work with the Qikiqtaaluk Corporation and Polar Knowledge Canada, on a three year pilot project in Cape Dorset to shred and bale metal waste for backhaul.

[redacted]

Increased capacity to treat and manage wastewater and storm water

As WTPs are upgraded and water consumption increases due to population growth and infrastructure development, so too must the capacity for wastewater treatment in communities.

Wastewater treatment in Nunavut is primarily accomplished by lagoon-wetland systems and when necessary mechanical plants. The effluent generated through treatment is released into a final receiving environment, which for most communities is the ocean.

Nunavut has identified the potential need for four repair or replacement wastewater treatment projects across Nunavut. These projects will provide a concerted effort to upgrade the limited wastewater treatment capacity across the Territory since 2010.

Communities, Culture and Recreation Infrastructure

Community Infrastructure

Nunavut faces a severe shortage of infrastructure to support basic community programming and service needs. Lacking adequate space, communities struggle to provide the public with counselling programs, prenatal programs, early learning centres, youth spaces, as well as spaces for elders. In many communities, much needed programs cannot be offered due to lack of facilities.

The space needed to deliver programs and services is substandard, non-compliant with today's building codes and often unsafe, if the space exists at all. Communities often use buildings well past their expected service lives. Increased demands to service a fast growing, young population also creates additional burdens upon existing social infrastructure.

For example, only ten of Nunavut's 25 communities have youth centres. In communities without safe spaces and recreational opportunities for youth, Nunavut's youth face a higher risk of feeling powerless and isolated, which can lead to increased health and mental wellness issues.

Community wellness hubs offer an effective model for program and service delivery. When hubs are co-located with service providers, citizens can gain access to the full continuum of services, such as social services and health care programs.

This is a marked improvement over the current situation in Nunavut, where government and community organizations lack adequate space to provide needed programs, such as:

- Alcohol and drug addiction counselling
- Services for family violence victims
- Suicide prevention activities
- Support to elders
- Relationship and personal counselling space
- Healing programs
- Early learning centres and daycares
- Nutrition education
- Food security
- Parenting
- Income support and adult budgeting information
- On-the-land program preparation and training
- Traditional arts and crafts programs
- Wellness programs

With flexible, multi-purpose spaces, wellness hubs could help government and community organizations meet municipalities' unique needs. This has been confirmed by hubs operating in Cambridge Bay and Clyde River. These communities have succeeded in securing a shared space, optimizing it for multiple purposes, and integrating programs for different clients and groups.

A recent Ontario review found that community wellness hubs have many benefits including improved health, social and economic outcomes, opportunities to integrate service delivery to individuals, better social investment and stronger communities. Additional studies demonstrate a positive social return on hub investments.[1]

[redacted]

Harvesting, Country Food and Food Security

The 2014-16 *Nunavut Food Security Strategy and Action Plan* speaks to how Nunavummiut have a long standing knowledge of how to obtain, store, prepare, and consume country food, but that there is concern that these skills are not being transferred to younger generations, or that similar

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[1] **Government of Ontario. 2017. *Community hubs in Ontario: A strategic framework and action plan.* [ONLINE] Available at: https://www.ontario.ca/page/community-hubs-ontario-strategic-framework-and-action-plan.**

skills related to store bought food are not being acquired. As such, it is important to provide opportunities for skills and knowledge development related to both country food and store-bought food. Community based programs play a critical role in this regard.

Harvesting is an important function in Nunavut and is an integral part of the northern culture and economy. Much of the Inuit culture flows from experiences on the land and working with products of the harvest. The values and relationships developed from working on the land form the core of the Inuit Societal Values that guide and inspire the work of the Government of Nunavut.

Traditions surrounding country food are an anchoring force in Nunavut's culture and heavily influence community wellbeing. Country food is the freshest, highest quality and most nutritious food available in Nunavut. To that effect, Nunavut's Department of Health strongly recommends that Nunavummiut "eat country food as often as you can."

Improving the ability of harvesters to provide food to the community is one of six themes in Nunavut's Food Security Strategy and Action Plan. It is consistently identified as a critical priority in community consultations and highlighted by the regional Inuit associations in their economic development plans.

In Nunavut, there are substantial harvests that take place from the late spring to the early fall when the temperature is above the food safe storage temperature of -18oC. Having safe storage and processing infrastructure allows hunters to harvest to the environmentally sustainable level rather than being constrained by the size of their personal freezer.

Preserving Inuit Culture and Promoting Nunavut's Heritage

Since 1999, the GN has divided its combined heritage assets between Yellowknife, Winnipeg and Ottawa repositories. A centralized administration of GN archives, archaeology, museum objects, by way of a heritage facility, is wanted for efficient administration and public access to tangible cultural assets including art as well as to serve as a significant attraction for visitors to Nunavut. The GN recognizes the importance of establishing a Nunavut Heritage Centre (NHC). It was identified as a priority in the Pinasuaqtavut and Tamapta Action Plans and the NLCA emphasizes that there is an urgent need to establish facilities in the Nunavut Settlement Area for the conservation and management of a representative portion of the archaeological record.

From an economic development perspective, the Cultural Industries sector connects Nunavummiut with their history, enables and encourages inter-generational relationships, and forms a key element of the economy. Most recent estimates indicate that out of a total population of 36,000 approximately 7,650 Nunavummiut self-identify as artists.

Unfortunately, Nunavut is the only jurisdiction in Canada without a designated Cultural Center to share and showcase Inuit history and culture, as well as provide a space for live performances and on-screen shows. Over the past few years, many different approaches involving multiple stakeholders have been entertained. As a result of stakeholder interaction in the last three years,

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a common vision has emerged for a project to develop a Nunavut Cultural Centre. The project will benefit Nunavut artists, Nunavummiut, and the Government of Nunavut.

Performing artists (theatre, circus, music, multi-media, etc.) will have a professional stage to rehearse and present their creations; where visual artists can showcase their work in a professionally curated and equipped space, and filmmakers will have access to a large theatre to premiere their films in Nunavut.

Nunavummiut will have permanent access the Nunavut Art Collection; to enhance their pride in their art, culture and heritage; and gain inspiration for creative work rooted in their own history. A Cultural Centre would also increase the quality of life for Nunavummiut by providing access to performances, concerts, arts festivals; not to mention increased job opportunities.

As for the Government of Nunavut, it will be able to count on increasing contributions from the cultural industries to Nunavut's GDP, sustained by the development a higher skilled workforce; growth in the cultural industries sector and increasing tourism activities.

[redacted]

Rural and Northern Communities Infrastructure

Going beyond community infrastructure

Strengthening Nunavut's communities through better social infrastructure requires addressing the full spectrum of housing issues in the Territory. Nunavummiut live in overcrowded housing units that often fail to meet national standards for housing adequacy. They also lack transitional, supportive or affordable housing required to live independently. Few communities provide long-term assisted living for the elderly.

The GN must find ways to help Nunavummiut move along the housing continuum from state ownership to privately owned rental housing and ultimately to home ownership. The more that these options become available, the greater the improvement in Nunavut's socio-economic development.

A *Framework for Action on Homelessness* was produced to examine the impact of absolute homelessness in Nunavut. Emergency shelters are intended to provide assistance for 4 to 6 week periods, however, many of these shelters are at maximum capacity year round, with many long-term residents.

There are only three emergency homeless shelters in Nunavut: the men's Uquutaq Shelter and Sivummut House for women and children in Iqaluit and the men's Omingmak Shelter in Cambridge Bay. There are five Family Violence Shelters in Nunavut, located in Iqaluit, Rankin Inlet, Kugaaruk, Kugluktuk and Cambridge Bay.

Increasing the variety of housing options for vulnerable Nunavummiut, especially where other care programs can be made available, is a key element of addressing the conditions behind the Truth and Reconciliation Commission.

Improving Nunavut's Telecommunications

Nunavut's telecommunication infrastructure is entirely dependent on satellite. This leaves the Territory at serious risk when technical issues occur and the connection is lost, affecting all communications and internet based business across Nunavut.

Nunavut needs to begin developing a fibre optic network to address this critical infrastructure risk. Such a project would have several other benefits, including ensuring the GN met the CRTC National Target, as the proposed project will focus on connecting Iqaluit to Nuuk, with built in redundancy through Kimmirut. This project will then allow the redirection of the current beams on Iqaluit and Kimmirut to the rest of Nunavut, helping increase their broadband capacity.

The creation of a fiber connection between Iqaluit and Nuuk will also encourage the development of a fibre optic network through the Northwest Passage, down the western coast of Hudson's Bay, and potentially up the Eastern coast of Baffin Island, should Greenland continue to expand its network northward.

Connectivity has become a standard expectation in most developed economies. Broadband networks are synonymous with basic infrastructure as both serve to connect Canadian citizens to the global economy. However, connectivity in Nunavut is fragile. The territory relies on satellite internet, with limited redundancy. Fourteen of Nunavut's 25 communities rely on a single satellite.

The Canadian Radio-television and Telecommunications Commission (CRTC) recently set out a *universal service objective* to provide Canadians in urban, rural, and remote areas with access to affordable, high-quality telecommunications services.[2]

At a minimum, the CRTC expects that every household should access download speeds of 50 megabits per second (Mbps) and uploads at 10 Mbps. Today, 29 per cent of Nunavut households can access five Mbps downloads. The maximum price for broadband in Nunavut, at $180/month, is more than double the maximum $85/month paid by other Canadians.[3]

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[2] **Canadian Radio-television and Telecommunications Commission. 2016. *rp161221.pdf*. [ONLINE] Available at: http://www.crtc.gc.ca/eng/publications/reports/rp161221/rp161221.pdf.**
[3] **Canadian Radio-television and Telecommunications Commission. 2016. *Communications Monitoring Report 2016*. [ONLINE] Available at: http://www.crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2016/cmri.htm.**

The CRTC's new five-year, $750 million broadband fund recently launched *Connect to Innovate*, which is expected to provide Nunavut with new service choices for voice and broadband internet. However, it will take a continued investment in *backbone* infrastructure and in particular, fibre optic networks to bring price and service on par with the rest of Canada. Investment in transportation corridors will also open up opportunities to reduce the cost of deploying fibre infrastructure to serve the Kitikmeot and Kivalliq regions.

The work ahead is extensive. Even in the initial planning stages, which are likely to take up to 30 months to complete, the tasks are complicated. They include updates to nautical charts, geological information, tidal information and local ice condition forecasts in order to determine optimum undersea cable routings and landing approaches.

Environmental reviews and permit processes are required for the marine and land-crossing components of proposed fibre systems. Also, a long-term maintenance and repair strategy is required to identify alternative systems that can maintain connectivity during prolonged system failures.

Strengthening Nunavut's Transportation Infrastructure

An efficient transportation infrastructure is the backbone of a healthy economy. Nunavut's socio-economic development is hindered by the territory's large infrastructure deficiency. No Canadian roads or railways lead to Nunavut. Supply ships are limited to a two-month shipping season due to ice conditions. Aircraft provide the only connection between Nunavut's 25 municipalities and the rest of the world. As a result, Nunavummiut pay much more than other Canadians for goods and services and the territory struggles to diversify and expand its economy.

Nunavut's reliance on year-round air transportation, its inadequate marine infrastructure and the absence of roads and railways between resource deposits and ports have forced Nunavut's economy to pay a significant price in delayed or denied opportunities to develop its mining and petroleum resources.

Nunavut must ensure that its current transportation system is safe, reliable and able to meet rising demand. As well, it must develop new infrastructure to connect the territory's mineral and petroleum wealth to national and global markets.

When Nunavut was created in 1999, it inherited 26 airports from the Northwest Territories. None of these were modern. Northern airstrips were developed to enable air defence stations to receive supplies by gravel-capable DC-3 propeller aircraft.

Since then, the GN has invested significant amounts of money to address safety and operations at its airports. In recent years, major improvements have been made at the three regional hub airports in Iqaluit, Rankin Inlet, and Cambridge Bay.

Other Nunavut airports have several pressing needs, as identified in a comprehensive 2014 study. In all, the 2014 study fund that Nunavut's airports needed $462 million of repairs and improvements.

Looking forward 20 years, the study noted a number of issues:

- Safety issues at Kimmirut and Pangnirtung were serious enough to warrant relocation of these airport.
- The Pond Inlet airport would need to become jet-capable for both civil and military purposes.
- Terminal buildings at Whale Cove, Chesterfield Inlet, Naujaat and Taloyoak need to be replaced.
- Kimmirut needs to build a temporary terminal until the community can relocate its airport.
- Rising traffic and passenger volumes at Iqaluit and Cambridge Bay require those terminals to be expanded.

Beyond the terminal buildings, the airport study found that Nunavut's airports require maintenance investments in mobile equipment, electrical equipment and facilities, runway repairs and extensions, and navigational improvements.

NAV Canada is intending to implement a satellite-based system to guide pilots to safe landings. However, 15 of 25 Nunavut airports are not equipped for any form of instrument-guided landing. The NAV Canada program will require significant capital spending.

Another example of much needed airport improvements is the use of automated airport weather stations which provide pilots with real-time weather information for their destinations. Without this information, airlines tend to cancel up to 25 per cent of their flights due to weather-impaired visibility. This directly impacts the travelling public as well as increases operating costs while reducing efficiency for airlines.

Looking beyond today's needs, Nunavut will also need to improve the accessibility of all its airports to accommodate a growing population of elderly, mobility-impaired Nunavummiut. Today the elderly comprise just four per cent of Nunavut's population but that proportion will continue to rise.

Investments in Economic Growth

Beyond the issue of maintaining Nunavut's airports, Nunavut's infrastructure shortage is also delaying opportunities to develop the territory's mining and mining-related industries. Nunavut needs to examine its road and marine infrastructure to determine how to better support the natural resource industries sustaining economic growth across the Territory.

These projects would aim to reduce Nunavut's isolation from the rest of Canada, decrease living costs, create commercial opportunities for Inuit, and facilitate the development of high-quality health and educational facilities.

Arctic Energy Fund

Nunavut's energy system differs from all other provinces and territories in that it is 100% reliant on diesel fuel generation. It also lacks a shared transmission grid, with each community relying on its own generation and distribution infrastructure. When power generation fails, it is not possible to re-route electricity from another community.

All Nunavut communities depend solely on imported diesel fuel for electrical generation and heating. The Qulliq Energy Corporation (QEC), the territory's electrical utility, maintains 25 stand-alone diesel plants in 25 communities. 11 generating stations installed four or five decades ago, are operating well beyond their design life.

[redacted]

The Arctic Energy Fund provides funding for projects to increase energy efficiency and/or reliability, and reduce carbon emissions within northern rural communities' infrastructure. This funding will also allow QEC to replace aging infrastructure in a faster timeframe than would have been otherwise possible.

PART 3: Attestation

I, Kyle Seeley, A/Assistant Deputy Minister, Local Government with the Department of Community and Government Services, Government of Nunavut attest that:

Funding received from the Investing in Canada Infrastructure Program will not displace Government of Nunavut spending on each of the asset classes funded through the program.

[redacted]

January 04, 2019
Date

Kyle Seeley
Co-Chair ICIP Oversight Committee
Acting / Assistant Deputy Minister
Community Infrastructure
Department of Community and
Government Services
Government of Nunavut

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Part 4: Preliminary Project Plan

The following preliminary project plan represents a range of projects with the potential to address challenges identified by the ICIP funding stream. Information provided in this project plan will be updated when required, or when projects are submitted for formal review and funding approval.

As per section 8. f) of the Canada Nunavut Integrated Bilateral Agreement, the submission of any Nunavut infrastructure plan to the federal Government of Canada does not constitute approval of projects by Canada; and does not prohibit Nunavut from submitting projects for approval by Canada that are not included in the submitted infrastructure plan.

Preliminary Project information

Project Title	Project Description	Location	Project Outcome(s)	National Target	Total project costs millions $
Green					
Water treatment	Installation of multi-barrier water treatment plants. Upgrade water treatment plants with water storage tanks where needed. Address raw water source issues where needed.	Nunavut	Increased access to potable water.	Eliminate long-term drinking water advisories	[redacted]
Iqaluit Solid Waste Site	New Solid Waste Management Site	Iqaluit	Increased capacity to reduce or remediate soil and air pollutants	None	[redacted]
Legacy Metal Waste	Removal of legacy metal waste in communities	Nunavut	Increased capacity to reduce or remediate soil and air pollutants	None	[redacted]
Wastewater treatment	Repair or replace wastewater treatment assets where needed	Nunavut	Increased capacity to treat and manage wastewater and storm water	None	[redacted]
Parking garages	Repair and replacement of parking garage space for water and sewage delivery trucks and other municipal heavy equipment	Nunavut	Increased access to potable water.	Eliminate long-term drinking water advisories	[redacted]
CLC fuel tank replacement	Replace end of life fuel tanks on affected Community Learning Centres	Nunavut	Increased capacity to reduce or remediate soil and air pollutants	None	[redacted]
PPD expansion and upgrades	Upgrade and expand Bulk Fuel Storage Capacity to meet environmental protection codes and meet fuel demand.	Nunavut	Increased capacity to reduce or remediate soil and air pollutants	None	[redacted]

Community Infrastructure					
Wellness Hubs	Dedicated space to support the delivery of full continuum of care focused on social services and health care programs.	Nunavut	Improved access to and increased quality of community, culture and recreation infrastructure	Meets the highest published, applicable accessibility standard in a respective jurisdiction.	[redacted]
Cultural Centre	Increase space dedicated to the preservation and promotion of Inuit Culture within communities	Nunavut	Improved access to and increased quality of community, culture and recreation infrastructure	Meets the highest published, applicable accessibility standard in a respective jurisdiction.	[redacted]
Nunavut Cultural Centre	Territorial centre for the promotion of inuit art and culture, a heritage centre for the preservation of inuit artifacts, and a business incubator for arts and crafts sector.	Nunavut	Improved access to and increased quality of community, culture and recreation infrastructure for vulnerable populations	Meets the highest published, applicable accessibility standard in a respective jurisdiction.	[redacted]
Multisport and recreation facility	Territorial facilities designed to support Nunavut's hosting of major games, such as the Arctic Winter Games.	Nunavut	Improved access to and increased quality of community, culture and recreation infrastructure for vulnerable populations	Meets the highest published, applicable accessibility standard in a respective jurisdiction.	[redacted]
Rural and Northern					
Fibre Optic Network	Installation of Fibre Network between Nunavut and Greenland	Nuuk - Iqaluit – Kimmirut	Improved broadband connectivity	Meets the highest published, applicable accessibility standard in a respective jurisdiction.	[redacted]
Transition housing	Housing dedicated to assist vulnerable demographic groups transition from emergency shelter to autonomous housing	Nunavut	Improved access to and increased quality of community, culture and recreation infrastructure for vulnerable populations	Meets the highest published, applicable accessibility standard in a respective jurisdiction.	[redacted]
Crisis housing	Shelter housing dedicated to youth vulnerable to homelessness	Nunavut	Improved access to and increased quality of community, culture and recreation infrastructure for vulnerable populations	Meets the highest published, applicable accessibility standard in a respective jurisdiction.	[redacted]
Safe Houses	Housing to support the Family Intervention Act to assist those being removed from situations of domestic violence.	Nunavut	Improved access to and increased quality of community, culture and recreation infrastructure for vulnerable populations	Meets the highest published, applicable accessibility standard in a respective jurisdiction.	[redacted]
Respite houses	Lower barrier service to help in the prevention of homelessness; a place where people can take a break from the stresses at home; a drop-in space where people can get supports they need; short-term stay if needed; 2 night maximum; 4 bed maximum	Nunavut	Improved access to and increased quality of community, culture and recreation infrastructure for vulnerable populations	Meets the highest published, applicable accessibility standard in a respective jurisdiction.	[redacted]
Group homes	Independent or supported living housing to assist with the repatriation of clients to Nunavut	Nunavut	Improved access to and increased quality of community, culture and recreation infrastructure for vulnerable populations	meets the highest published, applicable accessibility standard in a respective jurisdiction.	[redacted]

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Childcare for Family Services	Trauma informed licensed daycares for children in care of the Department of Family Services	Nunavut	Improved access to and increased quality of community, culture and recreation infrastructure for vulnerable populations		[redacted]
Community Freezers	Upgrading or replacement of community managed commercial freezers to support greater food security	Nunavut	Improved food security		[redacted]
Expansion of Correctional Healing Centres	Expansion of existing correctional healing facilities to increase programming	Nunavut	Improved education and health facilities (specific to Truth and Reconciliation Commission)		[redacted]
Health Facility enhancements	Enhancements to existing Health Centres to improve services	Nunavut	Improved education and health facilities (specific to Truth and Reconciliation Commission)		[redacted]
Health Centres	Replacement or expansion of Health Centres	Nunavut	Improved education and health facilities (specific to Truth and Reconciliation Commission)		[redacted]
Rankin Inlet Mental Wellness Treatment Centre	New mental wellness treatment facility for the delivery of quality mental health and addictions services across Nunavut	Rankin Inlet	Improved education and health facilities (specific to Truth and Reconciliation Commission)		[redacted]
Territorial Elders Care Facilities	New Elders Care Facilities to offer in territory treatment for dementia, based on Inuit language and culture	Nunavut	Improved education and health facilities (specific to Truth and Reconciliation Commission)		[redacted]
NAC Student Residence	Construction of student residences to support greater enrollment	Iqaluit	Improved education and health facilities (specific to Truth and Reconciliation Commission)		[redacted]
Community Learning Centres	Construction of new Community Learning Centres	Nunavut	Improved education and health facilities (specific to Truth and Reconciliation Commission)		[redacted]
Expansion of Kivalliq Campus and enhancement of Trades Centre	Construction of a new campus in Rankin Inlet	Rankin Inlet	Improved education and health facilities (specific to Truth and Reconciliation Commission)		[redacted]
Arviat Campus Development	Construction of a new administration building in Arviat	Arviat	Improved education and health facilities (specific to Truth and Reconciliation Commission)		[redacted]
Airport runway improvements	Resurfacing of runway with new crushed material	Nunavut	Improved and more reliable transportation access		[redacted]
Airport Terminal Building Expansion Rankin	Enhancement of the Airport Terminal Building in Rankin Inlet to support greater regional economic development.	Rankin Inlet	Improved and more reliable transportation access		[redacted]
Runway extension	Extension of runway in Naujaat to support greater payloads of cargo	Naujaat	Improved and more reliable transportation access		[redacted]

Airport Equipment shelters	Upgrade or replacement of airport maintenance equipment storage space	Nunavut	Improved and more reliable transportation access		[redacted]
Airport relocation (2)	Relocation of airports to address safety and capacity issues	Pangnirtung/ Kimmirut	Improved and more reliable transportation access		[redacted]
Qikiqtarjuaq Deep Sea Port	Development of deep sea port to develop commercial fishery	Qikiqtarjuaq	Improved and more reliable transportation access		[redacted]
Rankin Inlet Deep Sea Port	Development of deep sea port to support regional economic growth	Rankin Inlet	Improved and more reliable transportation access		[redacted]
Kivalliq Road system	Development of road system between all communities in the Kivalliq to support economic growth	Arviat, Whale Cove, Rankin Inlet, Chesterfield Inlet, Baker Lake	Improved and more reliable transportation access		[redacted]
GN IMIT projects	Expansion and upgrading of GN IT infrastructure.	Nunavut	Improved broadband connectivity		[redacted]
Arctic Energy Fund					[redacted]
Power station upgrades	Power plant infrastructure upgrades in an estimated 12 communities across Nunavut	Nunavut	Providing more efficient and/or reliable energy	Reduce the number of liters of diesel required per kilowatt hour of electricity by 4%	[redacted]
Other					[redacted]
Granular supply	Purchase of granular production equipment to ensure availability of crushed material in every community	Nunavut			
Hamlet offices	Several hamlet offices need to be replaced	Nunavut			
Education Facilities upgrades	Several projects to upgrade schools to improve maintenance costs	Nunavut			
Horticultural Program	Green house projects to support Department of Justice programming while addressing food security	Iqaluit			
Recycling program	Installation of recycling infrastructure to support waste diversion efforts in Iqaluit and Department of Justice programming	Iqaluit			

APPENDIX A: NUNAVUT POPULATION COUNTS

Nunavut Total Population Estimates by Age Group, Region and Community, 2017, as of July 1

	Total	0 to 4	5 to 14	15 to 24	25 to 44	45 to 64	65 and over
Nunavut	**37,985**	**4,366**	**7,368**	**6,326**	**11,269**	**7,145**	**1,511**
Baffin Region	20,150	2,304	3,647	3,234	6,205	3,930	830
Arctic Bay	973	165	187	178	261	126	56
Baffin unorganized[1]	x	x	0	0	0	x	0
Cape Dorset	1,623	194	322	273	442	304	88
Clyde River	1,088	143	241	200	305	157	42
Grise Fiord	142	x	31	27	41	32	x
Hall Beach	855	133	178	166	227	124	27
Igloolik	1,677	252	372	259	510	221	63
Iqaluit	8,011	705	1,113	1,121	2,849	1,974	249
Kimmirut	514	60	111	95	128	88	32
Pangnirtung	1,678	195	355	274	467	285	102
Pond Inlet	1,790	255	349	310	493	308	75
Qikiqtarjuaq	631	54	127	107	193	112	38
Resolute	247	20	54	38	59	62	14
Sanikiluaq	914	119	207	186	230	131	41
Keewatin Region	10,853	1,356	2,275	1,890	3,056	1,905	371
Arviat	2,687	367	624	467	777	370	82
Baker Lake	2,197	251	410	425	595	431	85
Chesterfield Inlet	395	40	78	62	119	65	31
Coral Harbour	915	143	188	187	236	134	27
Naujaat	1,099	191	276	186	283	136	27
Rankin Inlet	3,106	300	586	463	934	716	107
Whale Cove	454	64	113	100	112	53	12
Kitikmeot Region	6,982	706	1,446	1,202	2,008	1,310	310
Cambridge Bay	1,985	137	338	289	601	504	116
Gjoa Haven	1,484	157	361	256	434	201	75
Kugaaruk	860	104	234	164	245	96	17
Kugluktuk	1,664	183	292	287	484	353	65
Taloyoak	989	125	221	206	244	156	37

Notes: *1) Baffin and Kitikmeot unorganized areas include outpost camps. Unorganized areas may also include Nunavummiut whose usual residence could not be verified during revisions of the estimates.*

2) Postcensal estimates are based on the 2011 Census counts adjusted for census net undercoverage. Intercensal estimates are based on postcensal estimates and data adjusted for net census undercoverage of the censuses preceding and following the considered year.

Population estimates for July 1 are final intercensal from 2001 to 2010, final postcensal for 2011 to 2013, updated postcensal for 2014 to 2016 and preliminary postcensal for 2017.

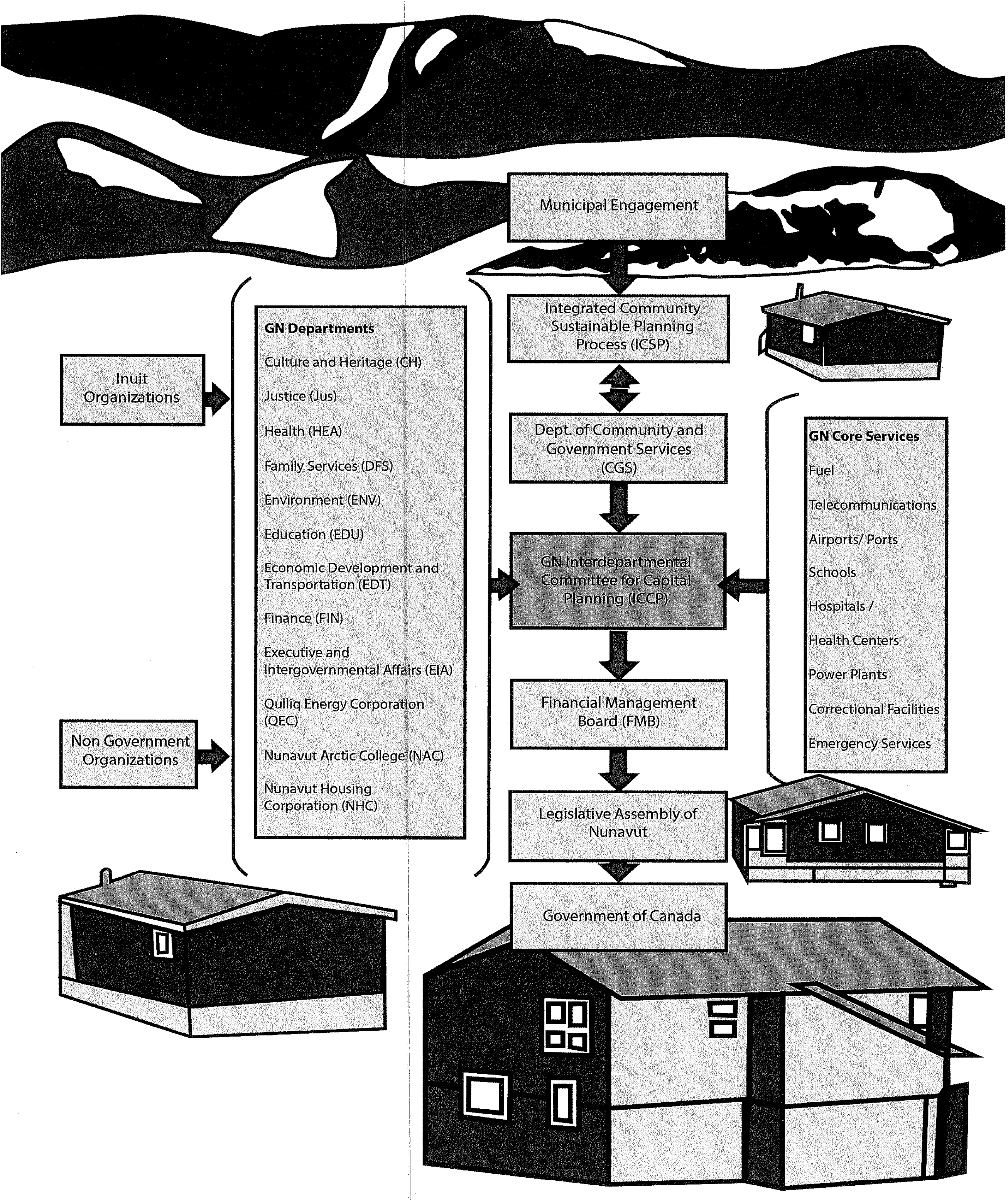
3) The community population estimates are "non-official" since they are not based on components of population growth (births, deaths and migration). They should be used with caution.

4) x Indicates that the estimates are suppressed for confidentiality reasons.

Source: Statistics Canada, Demography Division, Special tabulations

Prepared by: Nunavut Bureau of Statistics, March 15, 2018

APPENDIX B: ICIP PROJECTS SELECTION PROCESS



ATIA - 14

ATIA - 15(1)

ATIA - 19(1)

ATIA - 21(1)(b)

McCallum, Robert (INFC)

From:	Casson, Linda <LCasson@GOV.NU.CA>
Sent:	January 14, 2019 9:30 AM
To:	Swedlove, Rebecca (INFC)
Cc:	Bouchard, Jean-Francois; [redacted]
Subject:	FW: questions from INFC

Hi Rebecca
Here are the latest replies in red.

Cheers

Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336

lcasson@gov.nu.ca

Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

[redacted]

ATIA - 19(1)

ATIA - 14

McCallum, Robert (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: January 14, 2019 11:52 AM
To: Swedlove, Rebecca (INFC)
Cc: Bouchard, Jean-Francois; [redacted]
Subject: FW: Jan 14 Questions

Hi Rebecca

Here you are.
Linda

From: Bouchard, Jean-Francois
Sent: January 14, 2019 11:09 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: RE: Jan 14 Questions

Just another quick note,

[redacted]

ATIA - 14 ATIA - 15(1) ATIA - 21(1)(b)

From: Bouchard, Jean-Francois
Sent: Monday, January 14, 2019 11:06 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: RE: Jan 14 Questions

Hi Linda,

[redacted]

Page 71
is withheld
pursuant to paragraphs
13(1)(c) & 14
of the *Access to Information Act*

****

La page 71
Font l'objet d'une exception totale
conformément aux dispositions des
paragraphes
13(1)(c) & 14
de la *loi sur l'accès à l'information*

Trottier-Abbott, Catherine (INFC)

From: Swedlove, Rebecca (INFC)
Sent: January 18, 2019 9:21 AM
To: Trottier-Abbott, Catherine (INFC)
Subject: FW: Fibre - Quick update on NIRB progress

FYI

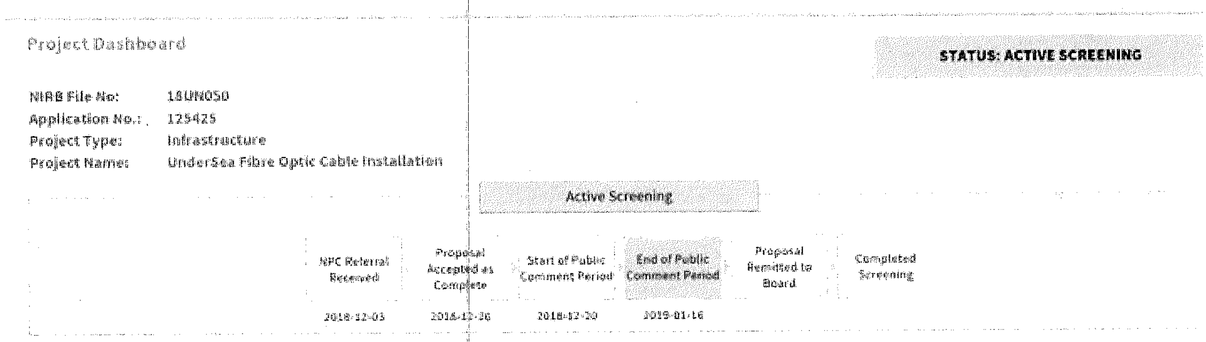
From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: January 17, 2019 2:19 PM
To: Swedlove, Rebecca (INFC) <rebecca.swedlove@canada.ca>
Subject: Fibre - Quick update on NIRB progress

Project has gone thru public screening and is back with the Board

From: Bouchard, Jean-Francois
Sent: January 17, 2019 1:46 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: Quick update on NIRB progress

Public screening completed.

Proposal will be remitted to the board today.
28 days of 45 completed.



(21)

Trottier-Abbott, Catherine (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: February 1, 2019 1:45 PM
To: Robbins, Laura (INFC); Trottier-Abbott, Catherine (INFC)
Cc: Djordjevic, Ana (INFC)
Subject: FW: Additional information supplemented to NIRB
Attachments: submarine fibre optic cables.jpg; armoured fibre cable.jpg; Typical Submarine Fibre Optic System.jpg

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Laura and Kate
Some additional information.

Linda

From: Bouchard, Jean-Francois
Sent: February 1, 2019 9:25 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: Additional information supplemented to NIRB

Linda,

Supplemental info submitted to NIRB that could be interesting for INFC.

From: Bouchard, Jean-Francois
Sent: Friday, February 1, 2019 9:19 AM
To: 'Keith Morrison' <kmorrison@nirb.ca>
Subject: RE: NIRB 125425/18UN050: Comments Received for GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

Good morning Keith,

I have received the following from our advisors and engineers.
Attached are cable, below diagrams of the HDD.

Is it what you were looking for?

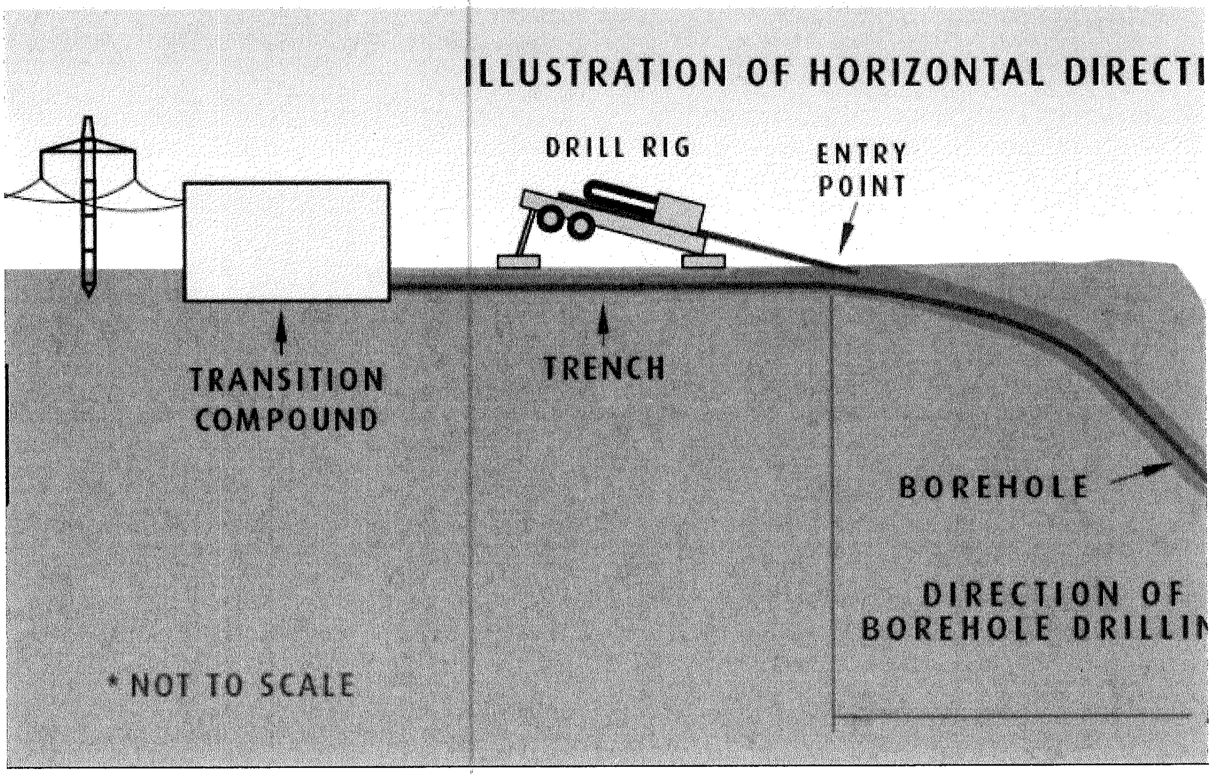
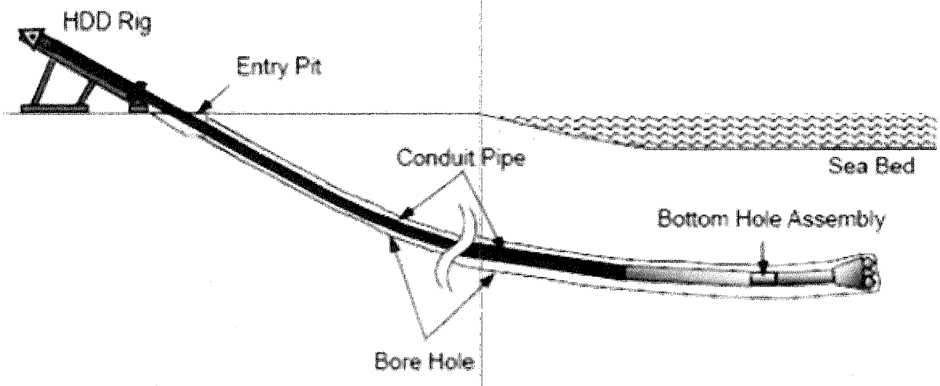
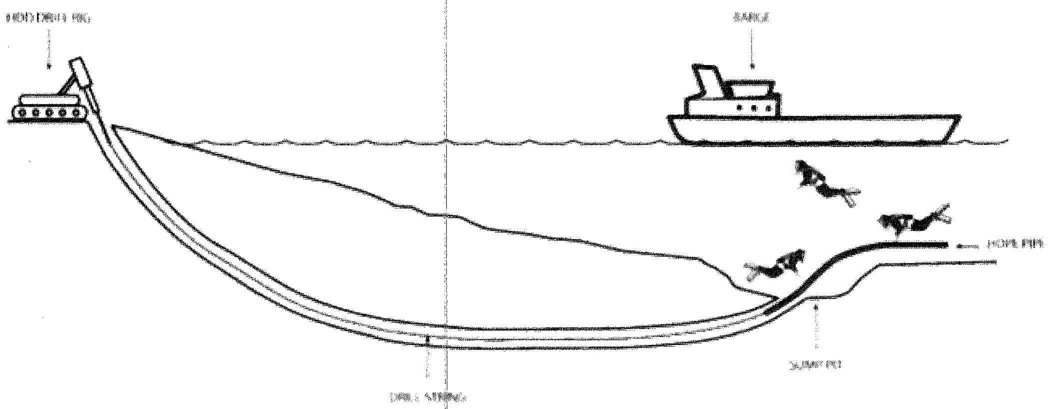


ILLUSTRATION OF HORIZONTAL DIRECTI
DRILL RIG
ENTRY
POINT
TRANSITION
COMPOUND
TRENCH
BOREHOLE
DIRECTION OF
BOREHOLE DRILLIN
* NOT TO SCALE

23





Hope this helps,

BR,

JF Bouchard

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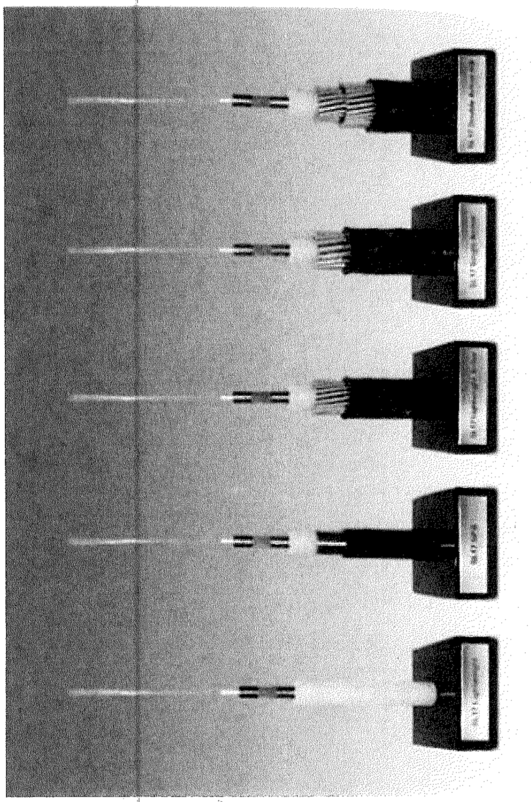
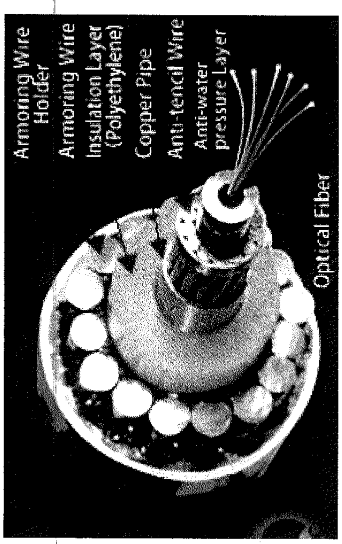
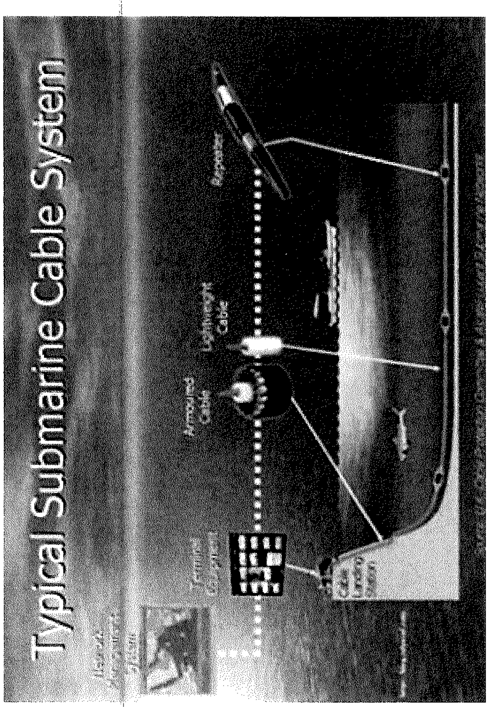


25


Armoring Wire Holder
Armoring Wire
Insulation Layer (Polyethylene)
Copper Pipe
Anti-tencil Wire
Anti-water pressure Layer
Optical Fiber

(26)


Typical Submarine Cable System
Armoured Cable
Lightweight Cable
Repeater

ATIA - 19(1)

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: February 8, 2019 2:58 PM
To: Passy, Stephen (INFC)
Cc: McCallum, Robert (INFC); Antinucci, Andrew (INFC); Swedlove, Rebecca (INFC); Djordjevic, Ana (INFC); Robbins, Laura (INFC); MacQuarrie, Duncan (INFC)
Subject: RE: NU Undersea Fibre Optic Cable

Thank you, Stephen, for this update and I look forward to working with Robert, Ana, and Andrew.

Would Tuesday be ok for a call? I would be free anytime after 11am.
It is actually very good timing, as the first meeting of the fibre project team is on Monday and Tuesday, and I will be sitting in for the Monday morning. I may have some brand new information to share!

If that doesn't work, then Thursday afternoon is wide open

All the best

Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: Passy, Stephen (INFC) <stephen.passy@canada.ca>
Sent: February 8, 2019 1:34 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Swedlove, Rebecca (INFC) <rebecca.swedlove@canada.ca>; Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Robbins, Laura (INFC) <laura.robbins@canada.ca>; MacQuarrie, Duncan (INFC) <duncan.macquarrie@canada.ca>
Subject: NU Undersea Fibre Optic Cable

Hi Linda,

I wanted to take a moment to update you on your INFC contacts for the ICIP Undersea Fibre Optic Cable Project. As you know, [redacted] Coinciding with her departure was a temporary re-org arrangement whereby my team

ATIA - 19(1)

ATIA - 21(1)(b)

will now report up through the Ontario region. This reporting relationship is currently envisioned to continue until at least June 2019.

This shift in reporting relationship means and its timeframes means that my team has been able to take advantage of some of the long-standing corporate memory, knowledge and resources on the Ontario side. To this end, effective immediately, Robert McCallum (613-948-9450) will be taking over as lead [redacted] Ana (613-946-0955) will continue to provide support to the project. In addition, Andrew Antinucci (613-946-5192) will also be assisting [redacted]

I will arrange a short file hand-over/meet and greet call early next week. Ideally Rebecca will sit in on that call. Let me know your preference for date and timing.

All your other files, including all your other ICIP projects, will continue to be handled by me and my team with no change to your points of contact.

Robert and team:

Linda's contact info is as follows:

Linda Casson
(867) 975-5336
LCasson@GOV.NU.CA
P.O. Box 1000, Iqaluit, NU X0A 0H1

Should you have any concerns, please do not hesitate to contact me.

Stephen

Stephen Passy
Manager, North
Program Operations Branch
North/Atlantic/Ontario Directorate
Infrastructure Canada /Government of Canada
Tel: 613-960-6790

Gestionnaire, Nord
Opérations des programmes
Direction générale du Nord/Atlantique/Ontario
Infrastructure Canada / Gouvernement du Canada
Tél: 613-960-6790

McCallum, Robert (INFC)

From: Djordjevic, Ana (INFC)
Sent: February 12, 2019 8:55 AM
To: Casson, Linda
Cc: Antinucci, Andrew (INFC); McCallum, Robert (INFC)
Subject: RE: Application received

Nothing new at the moment. There was however an email Rebecca sent you back in January where she outlined that it would be really helpful to get a better breakdown of the (new) finances, the permits needed/outstanding (and their status), and if we could get a better idea of the story behind the components that you sent to me and how they fit, what the particularities are, etc.

Just for reference, this is what Rebecca had asked for:

1) Would it be possible to break out this project into components? For example, Maintrunk install segments, branching units (list), landing sites (be specific), soft costs (e.g.). Include start and end dates for each plus a detailed description with an $ estimate for all.
2) Licences, permits etc. – list them. Include status, relevant dates and reason/purpose
3) What type of estimates (e.g. A, B, etc.) and who were they prepared by? What will the estimates be in the Spring/Summer.

I hope that makes sense. Good luck! ☺

Ana

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: February 12, 2019 8:46 AM
To: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>
Cc: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: RE: Application received

The fibre team is meeting at the moment and I'll be presenting at 10. Will get that update for you then.
Any updates I can provide them or questions?

Linda

From: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>
Sent: February 12, 2019 8:38 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: RE: Application received

Hi Linda,

Thanks for the update. Would you have any idea of how long it takes to have the licence approved?

Ana

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: February 12, 2019 8:05 AM
To: Robbins, Laura (INFC) <laura.robbins@canada.ca>
Cc: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>
Subject: FW: Application received

For your info.
The Application on the international submarine cable licence has been submitted.

Linda

From: Bouchard, Jean-Francois
Sent: February 12, 2019 6:45 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: FW: Application received

I suddenly have doubts
Whether or not I sent you this yesterday

It's a go on the international submarine cable licence

J

From: Calvery2, Ryan (IC) <ryan.calvery2@canada.ca>
Date: Monday, Feb 11, 2019, 4:40 PM
To: Bouchard, Jean-Francois <JBouchard@GOV.NU.CA>
Cc: Askarian, Atash (IC) <atash.askarian@canada.ca>
Subject: Application received

Hi Jean-Francois

I wanted to let you know that we have received your official application for the international submarine cable licence.

Regards

Ryan Calvery
Policy Analyst, Telecommunications Policy Branch
Innovation, Science and Economic Development/ Government of Canada
Ryan.Calvery2@canada.ca / Tel: 613-897-7532 / TTY: 1-866-694-8389

Analyste des Politiques, Direction générale de la politique des télécommunications
Innovation, Sciences et Développement économique / Gouvernement du Canada
Ryan.Calvery2@canada.ca /Tél: 613-897-7532 / ATS: 1-866-694-8389

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: February 12, 2019 3:10 PM
To: Trottier-Abbott, Catherine (INFC)
Cc: Djordjevic, Ana (INFC); McCallum, Robert (INFC); Antinucci, Andrew (INFC)
Subject: RE: Official application - EA

Hi Kate
I thought this would be of interest for you and your conversations with Mr McNeil may be really interesting.

Linda

From: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Sent: February 12, 2019 1:59 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: RE: Official application - EA

Many thanks, Linda. This confirms our thinking that PSPC has a role under CEAA 2012 for this project. I trust it wouldn't be an issue to contact Mark McNeil [redacted] and for our EA determination.

Thanks,
Kate

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: February-12-19 1:40 PM
To: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Cc: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: FW: Official application - EA

Additional confirmation of application for international cable licence and process for EA.

From: Calvery2, Ryan (IC) <ryan.calvery2@canada.ca>
Sent: Wednesday, January 16, 2019 9:51 AM
To: Bouchard, Jean-Francois <JBouchard@GOV.NU.CA>
Subject: RE: Official application

For the consideration of ISED's EA requirement it would be evaluated by Public Services and Procurement Canada (PSPC - Mark McNeil's team) and they submit a recommendation to ISED on EA compliance. Following the discussion on

the phone two weeks ago, Mark said he was comfortable working with NIRB's assessment but they may have to expand specific aspects of the NIRB review to meet Mark's approval recommendation.

As for the application itself there is no specific template. Applications are correspondences, addressed to the minister, requesting a licence with a high-level description of the project. In many instances they also state that they are currently working with ISED representatives to ensure regulatory compliance. You do not need to include any of the details required in the Regulations in the application request.

Ryan

From: Bouchard, Jean-Francois [mailto:JBouchard@GOV.NU.CA]
Sent: January-16-19 9:41 AM
To: Calvery2, Ryan (IC)
Subject: RE: Official application

Good morning Ryan,

I agree that a review is a great idea to have a review, I will totally go for that.

If you don't mind me asking.
Do we have samples or templates of the application letter I could use as an example?

The only part that puzzles me is the documentation indicating compliance with the EA. Which is the reason I've been waiting to submit thus far. waiting NIRB results as an EA compliance for the application requirement.

JF Bouchard

From: Calvery2, Ryan (IC) <ryan.calvery2@canada.ca>
Sent: Wednesday, January 16, 2019 9:03 AM
To: Bouchard, Jean-Francois <JBouchard@GOV.NU.CA>
Subject: RE: Official application

Sounds good. If you want me to look it over before you send it to the Minister I'm happy to do so.
Ryan

From: Bouchard, Jean-Francois [mailto:JBouchard@GOV.NU.CA]
Sent: January-15-19 8:03 PM
To: Calvery2, Ryan (IC)
Subject: RE: Official application

Sure!

I'll get this going right tomorrow morning

JF

Sent with BlackBerry Work
(www.blackberry.com)

From: Calvery2, Ryan (IC) <ryan.calvery2@canada.ca>

Date: Tuesday, Jan 15, 2019, 5:19 PM
To: Bouchard, Jean-Francois <JBouchard@GOV.NU.CA>
Subject: Official application

Hi Jean-Francois,

I was wondering if you are in a position to submit an official application for an international submarine cable licence. It would allow us to start working on the environmental assessment and you do not have to start submitting other requirements immediately.
You are also able to pause the application as you see fit.
I am able to help you with your application to the Minister as well.

Thanks

Ryan Calvery
Policy Analyst, Telecommunications Policy Branch
Innovation, Science and Economic Development/ Government of Canada
Ryan.Calvery2@canada.ca / Tel: 613-897-7532 / TTY: 1-866-694-8389

Analyste des Politiques, Direction générale de la politique des télécommunications
Innovation, Sciences et Développement économique / Gouvernement du Canada
Ryan.Calvery2@canada.ca /Tél: 613-897-7532 / ATS: 1-866-694-8389

ATIA - 16(2)

McCallum, Robert (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: February 13, 2019 2:15 PM
To: Antinucci, Andrew (INFC); Passy, Stephen (INFC); Djordjevic, Ana (INFC); Brown, Tim; Trottier-Abbott, Catherine (INFC); McCallum, Robert (INFC)
Subject: RE: Discussion - Undersea Fibre Optic Cable Installation project

Hi all
Are we still holding these regular meetings on the Fibre project? if so, I'll need to forward to a few more people.

Thanks

Linda

-----Original Appointment-----
From: Swedlove, Rebecca (INFC) <rebecca.swedlove@canada.ca>
Sent: November 29, 2018 2:13 PM
To: Swedlove, Rebecca (INFC); Passy, Stephen (INFC); Djordjevic, Ana (INFC); Syed, Fariya (INFC); Brown, Tim; Casson, Linda; Trottier-Abbott, Catherine (INFC)
Subject: Discussion - Undersea Fibre Optic Cable Installation project
When: February 20, 2019 10:00 AM-10:30 AM (UTC-05:00) Eastern Time (US & Canada).
Where: 9-001

Recurring meeting (third Wed. every month) to discuss the Undersea Fibre Optic Cable Installation project.

North-Atlantic	
Participant Code	[redacted]
Local Dial-in number	613-960-7516
Toll-free Dial-in number	1 877-413-4792

Hi,

Was just discussing the status of this project with Fariya and the suggestion was made that we should set up a regular meeting schedule to keep this project moving forward.

Building on the last call we had Rebecca, If we are going to have meetings, might as well make it official and call it a steering committee, with notes and action items being recorded.

Can we agree to meet monthly on this project to make sure we are meeting our targets? Let me know what a suitable recurring date would be.

Thanks,

Tim

Tim Brown
Director
Community Support and Infrastructure
Community and Government Services
(867) 975-5463

McCallum, Robert (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: February 19, 2019 1:54 PM
To: McCallum, Robert (INFC)
Cc: Djordjevic, Ana (INFC); Antinucci, Andrew (INFC); Trottier-Abbott, Catherine (INFC); Brown, Tim
Subject: RE: Undersea Fibre Optic Cable Installation project

Thank you, Robert.
Looking forward to our call tomorrow.

Qujannamiik/Merci/Thank You

Linda Casson

☎ 867-975-5336
✉ lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: February 19, 2019 1:52 PM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>; Casson, Linda <LCasson@GOV.NU.CA>
Cc: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Subject: Undersea Fibre Optic Cable Installation project

Hi Linda and Tim:

I'm the new manager looking after this project, as per the message from Stephen Passy a week or so ago.

We'd like to proceed with the monthly call tomorrow (Wednesday Feb 20) at 10 am EST. I trust it's in all our calendars. Please let me know if you are still available.

Thanks,

Robert G. McCallum, P.Eng.
Chief Engineer
(613) 948-9450
robert.mccallum@canada.ca

McCallum, Robert (INFC)

From: Brown, Tim <Tim.Brown@GOV.NU.CA>
Sent: February 19, 2019 1:57 PM
To: McCallum, Robert (INFC); Casson, Linda
Cc: Djordjevic, Ana (INFC); Antinucci, Andrew (INFC); Trottier-Abbott, Catherine (INFC)
Subject: RE: Undersea Fibre Optic Cable Installation project

Hi Robert,

I will not be available, but Linda should be.

Linda were there others from our team to be on this call?

Tim

Tim Brown
Director
Community Support and Infrastructure
Community and Government Services
(867) 975-5463

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: February 19, 2019 1:52 PM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>; Casson, Linda <LCasson@GOV.NU.CA>
Cc: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Subject: Undersea Fibre Optic Cable Installation project

Hi Linda and Tim:

I'm the new manager looking after this project, as per the message from Stephen Passy a week or so ago.

We'd like to proceed with the monthly call tomorrow (Wednesday Feb 20) at 10 am EST. I trust it's in all our calendars. Please let me know if you are still available.

Thanks,

Robert G. McCallum, P.Eng.
Chief Engineer
(613) 948-9450
robert.mccallum@canada.ca

ATIA - 19(1)

McCallum, Robert (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: February 19, 2019 3:42 PM
To: Passy, Stephen (INFC); McCallum, Robert (INFC); Antinucci, Andrew (INFC); Djordjevic, Ana (INFC)
Cc: Robbins, Laura (INFC)
Subject: RE: contacting the FIbre Project team

Thanks, Stephen. Appreciate your help.

From: Passy, Stephen (INFC) <stephen.passy@canada.ca>
Sent: February 19, 2019 2:43 PM
To: Casson, Linda <LCasson@GOV.NU.CA>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>
Cc: Robbins, Laura (INFC) <laura.robbins@canada.ca>
Subject: RE: contacting the FIbre Project team

Hi Linda,

My understanding is that he was planning on going ahead with tomorrow's standing meeting. He can update you on where things are at on the INFC side of things at that time.

I've included Rob on this email so he can contact you if he has other plan for the meeting time.

Stephen

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: February 19, 2019 1:18 PM
To: Passy, Stephen (INFC) <stephen.passy@canada.ca>; Robbins, Laura (INFC) <laura.robbins@canada.ca>
Subject: contacting the FIbre Project team

Hi Stephen and Laura
[redacted] Do you have any suggestions? The next meeting is scheduled for tomorrow at 10. An Advisory Committee meeting for the fibre project is scheduled for tomorrow afternoon and I was hoping to provide an update – no matter how small.

Qujannamiik/Merci/Thank You

Linda Casson

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Manager, Infrastructure Programs
Department of Community and
Government Services
Government of Nunavut

Atanguyaq, Nunalaaniituni
Tunngavikhaliqiyunut
Nunalingni Kavamatkunnilu
Pivikhaqautikkut
Nunavut Kavamanga

Gestionnaire, programmes d'Infrastructure
Ministère des Services communautaires et
gouvernementaux,
Gouvernement du Nunavut

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

Trottier-Abbott, Catherine (INFC)

From: Trottier-Abbott, Catherine (INFC)
Sent: February 19, 2019 8:36 AM
To: Casson, Linda
Subject: Re: Official application - EA

Hi Linda, I just want to confirm that I'll reach out to public works to request a status update on the section 67 (federal lands) requirement.
Thanks,
Kate

Sent from my iPhone

On Feb 12, 2019, at 1:58 PM, Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca> wrote:

> Many thanks, Linda. This confirms our thinking that PSPC has a role under CEAA 2012 for this project. I trust it wouldn't be an issue to contact Mark McNei[redacted] and for our EA determination.
>
> Thanks,
> Kate
>
> **From:** Casson, Linda [mailto:LCasson@GOV.NU.CA]
> **Sent:** February-12-19 1:40 PM
> **To:** Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
> **Cc:** Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
> **Subject:** FW: Official application - EA
>
> Additional confirmation of application for international cable licence and process for EA.
>
> **From:** Calvery2, Ryan (IC) <ryan.calvery2@canada.ca>
> **Sent:** Wednesday, January 16, 2019 9:51 AM
> **To:** Bouchard, Jean-Francois <JBouchard@GOV.NU.CA>
> **Subject:** RE: Official application
>
> For the consideration of ISED's EA requirement it would be evaluated by Public Services and Procurement Canada (PSPC - Mark McNeil's team) and they submit a recommendation to ISED on EA compliance. Following the discussion on the phone two weeks ago, Mark said he was comfortable working with NIRB's assessment but they may have to expand specific aspects of the NIRB review to meet Mark's approval recommendation.
>
> As for the application itself there is no specific template. Applications are correspondences, addressed to the minister, requesting a licence with a high-level description of the project. In many instances they also state that they are currently working with ISED representatives to ensure regulatory compliance. You do not need to include any of the details required in the Regulations in the application request.

(15)

Ryan

From: Bouchard, Jean-Francois [mailto:JBouchard@GOV.NU.CA]
Sent: January-16-19 9:41 AM
To: Calvery2, Ryan (IC)
Subject: RE: Official application

Good morning Ryan,

I agree that a review is a great idea to have a review, I will totally go for that.

If you don't mind me asking.
Do we have samples or templates of the application letter I could use as an example?

The only part that puzzles me is the documentation indicating compliance with the EA. Which is the reason I've been waiting to submit thus far. waiting NIRB results as an EA compliance for the application requirement.

JF Bouchard

From: Calvery2, Ryan (IC) <ryan.calvery2@canada.ca>
Sent: Wednesday, January 16, 2019 9:03 AM
To: Bouchard, Jean-Francois <JBouchard@GOV.NU.CA>
Subject: RE: Official application

Sounds good. If you want me to look it over before you send it to the Minister I'm happy to do so.
Ryan

From: Bouchard, Jean-Francois [mailto:JBouchard@GOV.NU.CA]
Sent: January-15-19 8:03 PM
To: Calvery2, Ryan (IC)
Subject: RE: Official application

Sure!

I'll get this going right tomorrow morning

JF

Sent with BlackBerry Work
(www.blackberry.com)

From: Calvery2, Ryan (IC) <ryan.calvery2@canada.ca>
Date: Tuesday, Jan 15, 2019, 5:19 PM
To: Bouchard, Jean-Francois <JBouchard@GOV.NU.CA>
Subject: Official application

Hi Jean-Francois,

(16)

I was wondering if you are in a position to submit an official application for an international submarine cable licence.
It would allow us to start working on the environmental assessment and you do not have to start submitting other requirements immediately.
You are also able to pause the application as you see fit.
I am able to help you with your application to the Minister as well.

Thanks

Ryan Calvery
Policy Analyst, Telecommunications Policy Branch
Innovation, Science and Economic Development/ Government of Canada
Ryan.Calvery2@canada.ca / Tel: 613-897-7532 / TTY: 1-866-694-8389

Analyste des Politiques, Direction générale de la politique des télécommunications
Innovation, Sciences et Développement économique / Gouvernement du Canada
Ryan.Calvery2@canada.ca /Tél: 613-897-7532 / ATS: 1-866-694-8389

Trottier-Abbott, Catherine (INFC)

From:	Trottier-Abbott, Catherine (INFC)
Sent:	February 21, 2019 3:32 PM
To:	Keith Morrison
Subject:	RE: Undersea fibre optic cable project - NIRB assessment

Many thanks Keith, for your helpful information.

Best,
Kate

From: Keith Morrison [mailto:kmorrison@nirb.ca]
Sent: February-21-19 12:37 PM
To: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Subject: RE: Undersea fibre optic cable project - NIRB assessment

Morning, Catherine.

I'm not able to comment on what the Board's recommendation will be at this time. I would note, however, that for the Arctic Fibre project—which was significantly larger in terms both of area and potential impacts than this one—the Board approved the project, deemed the screening to be sufficient, and that it did not require a full review. You may take that piece of data as you will.

--
Keith Morrison
Technical Advisor II
Nunavut Impact Review Board
Ph 867-983-4617

From: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Sent: February-21-19 9:10 AM
To: Keith Morrison <kmorrison@nirb.ca>
Subject: RE: Undersea fibre optic cable project - NIRB assessment

Hi Keith,
Many thanks for your quick reply to my note. Are you able to comment on the likelihood of this project requiring further review by the Board? [redacted]
Kate

From: Keith Morrison [mailto:kmorrison@nirb.ca]
Sent: February-20-19 4:27 PM
To: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Subject: RE: Undersea fibre optic cable project - NIRB assessment

Hi, Catherine.

The submission is about to go to our Board for the screening decision and should be coming out within the next week and a half or so.

--

Keith Morrison
Technical Advisor II
Nunavut Impact Review Board
Ph 867-983-4617

From: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Sent: February-20-19 9:44 AM
To: Keith Morrison <kmorrison@nirb.ca>
Subject: Undersea fibre optic cable project - NIRB assessment

Hi Keith,

My name is Catherine (Kate) Trottier-Abbott, and I work for Infrastructure Canada (INFC). We're currently reviewing a funding application for an undersea fibre optic cable project proposed by the territorial government of Nunavut (GN).

My understanding is that NIRB is currently completing a screening level assessment on the project. Would it be possible for you to provide a sense of when the assessment will be completed?

I have also learned that the marine survey required for this project will not be completed until the fall 2019. Will the fact that the marine survey is incomplete affect the NIRB assessment?

Please feel free to give me a call at my coordinates below if you would like to discuss and many thanks in advance,

Kate

Catherine Trottier-Abbott

Senior Environmental Review & Approvals Officer
Infrastructure Canada/ Government of Canada
catherine.trottier-abbott@canada.ca / Tel: 613-948-9764
Cellular: [redacted]

Agente principale d'évaluation environnementale et approbations
Infrastructure Canada /Gouvernement du Canada
catherine.trottier-abbott@canada.ca / Tél. : 613-948-9764
Cellulaire: [redacted]

ATIA - 14

ATIA - 21(1)(b)

McCallum, Robert (INFC)

From: McCallum, Robert (INFC)
Sent: February 21, 2019 4:32 PM
To: 'Brown, Tim'
Subject: RE: Undersea Fibre Optic Cable Installation project

Hi Tim

We had a productive call with Linda on Tuesday. We do want to follow up with you on a couple of key points we touched on, about which we want to be certain, as we will be briefing up, and don't want to misrepresent your current thinking. Specifically:

[redacted]

Are you available for a quick phone call tomorrow (Friday) on these points? I'm available anytime after 10:30 pm EST.

Thanks,

Rob

From: Brown, Tim [mailto:Tim.Brown@GOV.NU.CA]
Sent: February 19, 2019 1:57 PM
To: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Casson, Linda <LCasson@GOV.NU.CA>
Cc: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Subject: RE: Undersea Fibre Optic Cable Installation project

Hi Robert,

I will not be available, but Linda should be.

Linda were there others from our team to be on this call?

Tim

Tim Brown
Director
Community Support and Infrastructure
Community and Government Services
(867) 975-5463

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: February 19, 2019 1:52 PM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>; Casson, Linda <LCasson@GOV.NU.CA>
Cc: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Subject: Undersea Fibre Optic Cable Installation project

Hi Linda and Tim:

I'm the new manager looking after this project, as per the message from Stephen Passy a week or so ago.

We'd like to proceed with the monthly call tomorrow (Wednesday Feb 20) at 10 am EST. I trust it's in all our calendars. Please let me know if you are still available.

Thanks,

Robert G. McCallum, P.Eng.
Chief Engineer
(613) 948-9450
robert.mccallum@canada.ca

Antinucci, Andrew (INFC)

From: Djordjevic, Ana (INFC)
Sent: February 28, 2019 3:35 PM
To: Antinucci, Andrew (INFC); McCallum, Robert (INFC)
Subject: FW: NIRB 125425 / 18UN050: Screening Decision Report for the GN's "UnderSea Fibre Optic Cable Installation" Project Proposal
Attachments: 190228-18UN050-Cover Ltr Re Screening Decision Report-OT6E.pdf; 190228-18UN050-Screening Decision Report-OT6E.pdf

FYI

I was randomly scrolling and came across a section entitled "public comments and concerns" on page 5 – interesting stuff.

Ana

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: February 28, 2019 2:58 PM
To: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Cc: Barry Reimer [redacted]
Subject: FW: NIRB 125425 / 18UN050: Screening Decision Report for the GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

Great news! NIRB screening complete.

Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: Bouchard, Jean-Francois
Sent: February 28, 2019 1:34 PM
To: Wells, Dean <Dean.Wells@gov.nu.ca>; Hickey, Ted <Ted.Hickey@gov.nu.ca>; Barry Reimer [redacted]
Cc: Devereaux, Eiryn <EDevereaux@GOV.NU.CA>; Mulak, Paul <PMulak@GOV.NU.CA>; Casson, Linda <LCasson@GOV.NU.CA>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: FW: NIRB 125425 / 18UN050: Screening Decision Report for the GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

Hi All,

This is to inform you that the NIRB screening has been completed.

Highlight
"Subject to the Proponent's compliance with the terms and conditions as set out in below, **the NIRB is of the view that the project proposal is not likely to cause significant public concerns, and it is unlikely to result in significant adverse environmental and social impacts**. The NIRB therefore recommends that the responsible Minister accepts this Screening Decision Report."

From: NIRB Enterprise Management System <noreply@nirb.ca>
Sent: Thursday, February 28, 2019 1:25 PM
To: info@nirb.ca
Subject: NIRB 125425 / 18UN050: Screening Decision Report for the GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

Dear Jean-Francois Bouchard:

Please find attached the Nunavut Impact Review Board's (NIRB or Board) Cover Letter and the Screening Decision Report for the Government of Nunavut's (GN) "UnderSea Fibre Optic Cable Installation" project proposal (NIRB: 18UN050; NPC: 148937).

Further, please note that the Notice of Release of Screening Decision Report for this file will be forwarded to the offices responsible for issuing any authorizations related to this project.

Best regards,

Cassel Kapolak
Environmental Administrator

Nunavut Impact Review Board
29 Mitik Street
P.O. Box 1360
Cambridge Bay
NU, X0B 0C0 Canada
Phone: (867) 983-4600
Toll Free: 1-866-233-3033
Fax: (867) 983-2594
Email: info@nirb.ca
Web: www.nirb.ca

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NUNAVUT IMPACT REVIEW BOARD
NUNAVUMI AVATILIKIYIN KATIMAYIN

NIRB File No.: 18UN050
NPC File No.: 148937

February 28, 2019

To: The Honourable Dominic LeBlanc, P.C., Q.C., M.P
Minister of Intergovernmental Affairs and Northern Affairs and Internal Trade
House of Commons
Government of Canada
Ottawa, ON K1A 0A6

Sent via email: Dominic.leblanc@parl.gc.ca and Dominic.LeBlanc@iga-aig.gc.ca

Re: Screening Decision for Government of Nunavut's "Undersea Fibre Optic Cable Installation" Project Proposal, Qikiqtani Region

Dear Honourable Minister:

On December 3, 2018 the Nunavut Impact Review Board (NIRB or Board) received a referral to screen the Government of Nunavut's (GN) "Undersea Fibre Optic Cable Installation" project proposal from the Nunavut Planning Commission (NPC or Commission), which noted that the project proposal is outside the area of an applicable regional land use plan.

Pursuant to Article 12, Sections 12.4.1 and 12.4.4 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*) and s. 87 of the *Nunavut Planning and Project Assessment Act*, S.C. 2013, c. 14, s. 2 (*NuPPAA*), the NIRB commenced screening this project proposal and assigned it file number 18UN050.

Following the assessment of all material information provided, the NIRB is recommending that a review of the Government of Nunavut's (GN) "Undersea Fibre Optic Cable Installation" project is not required pursuant to paragraph 92(1)(a) of the *NuPPAA*.

Pursuant to its discretion under paragraph 92(2)(a) of the *NuPPAA*, the NIRB has determined that specific terms and conditions are appropriate for this project.

Accordingly, the NIRB is issuing the attached Screening Decision Report dated February 28, 2019 to the responsible Minister. The Screening Decision Report provides, among other things, the regulatory framework, project overview and the NIRB's assessment process, factors relevant for the determining significance of impacts and recommended project-specific terms and conditions.

Please note that the project proposal will not be enclosed due to the size of the electronic document and the limited bandwidth. However, an electronic copy of the project proposal is accessible online from the NIRB's online public registry at www.nirb.ca/project/125425.

Please note that, the Board only directly addresses these notice letters to those individuals considered to be a "responsible Minister with decision-making authority" for the project as set out under the *NuPPAA*. However, regulatory authorities and other authorizing agencies associated with a proposed project (e.g. Regional Inuit Associations, Nunavut Water Board) will continue to be copied on the Notice of Release of the Screening Decision Report. The NIRB is providing these parties with notice and access to the Board's Screening Decision Report as required under s. 200(2) and in support of these parties in the fulfillment of their responsibilities under the *NuPPAA* and the *Nunavut Agreement* to address, and as appropriate, implement, to the fullest extent possible, any relevant NIRB recommendations contained in the Screening Decision Report.

We look forward to receiving a response from the responsible Minister and the NIRB remains available for consultation with the Minister regarding this report as necessary.

If you have any questions or require clarification, please do not hesitate to contact the NIRB's Director, Technical Services, Tara Arko at (867) 983-4611 or tarko@nirb.ca.

Sincerely,

[redacted]

Elizabeth Copland, Chairperson
Nunavut Impact Review Board

cc: P.J Akeeagok, President, Qikiqtani Inuit Association
The Honourable Lorne Kusugak, Minister of Community & Government Services, Government of Nunavut
The Honourable Navdeep Bains, P.C., Minister of Innovation, Science and Economic Development, Government of Canada

Enclosure: Screening Decision Report, NIRB File No.: 18UN050 (February 28, 2019)

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NUNAVUT IMPACT REVIEW BOARD
NUNAVUMI AVATILIKIYIN KATIMAYIN

SCREENING DECISION REPORT
NIRB FILE No.: 18UN050

NPC File No.: 148937

February 28, 2019

Following the Nunavut Impact Review Board's (NIRB or Board) assessment of all materials provided, the NIRB is recommending that a review of the Government of Nunavut's (GN) "Undersea Fibre Optic Cable Installation" project proposal is not required pursuant to Article 12, Section 12.4.4(a) of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*) and s. 92(1)(a) of the *Nunavut Planning and Project Assessment Act*, S.C. 2013, c. 14, s. 2 (*NuPPAA*).

Subject to the Proponent's compliance with the terms and conditions as set out in below, the NIRB is of the view that the project proposal is not likely to cause significant public concerns, and it is unlikely to result in significant adverse environmental and social impacts. The NIRB therefore recommends that the responsible Minister accepts this Screening Decision Report.

OUTLINE OF SCREENING DECISION REPORT

P.O. Box 1360 Cambridge Bay, NU X0B 0C0 Phone: (867) 983-4600 Fax: (867) 983-2594

The primary objectives of the NIRB are set out in Article 12, Section 12.2.5 of the *Nunavut Agreement* and are confirmed by s. 23 of the *NuPPAA*:

> *Nunavut Agreement*, Article 12, Section 12.2.5: In carrying out its functions, the primary objectives of NIRB shall be at all times to protect and promote the existing and future well-being of the residents and communities of the Nunavut Settlement Area, and to protect the ecosystemic integrity of the Nunavut Settlement Area. NIRB shall take into account the well-being of the residents of Canada outside the Nunavut Settlement Area.

The purpose of screening is provided for under Article 12, Section 12.4.1 of the *Nunavut Agreement* and s. 88 of the *NuPPAA* which states:

> *NuPPAA*, s. 88: The purpose of screening a project is to determine whether the project has the potential to result in significant ecosystemic or socio-economic impacts and, accordingly, whether it requires a review by the Board...

To determine whether a review of a project is required, the NIRB is guided by the considerations as set out under Article 12, Section12.4.2(a) and (b) of the *Nunavut Agreement* and s. 89(1) of *NuPPAA* which states:

> *NuPPAA*, s. 89(1): The Board must be guided by the following considerations when it is called on to determine, on the completion of a screening, whether a review of the project is required:
>
> (a) a review is required if, in the Board's opinion,
>
> i. the project may have significant adverse ecosystemic or socio-economic impacts or significant adverse impacts on wildlife habitat or Inuit harvest activities,
>
> ii. the project will cause significant public concern, or
>
> iii. the project involves technological innovations, the effects of which are unknown; and
>
> (b) a review is not required if, in the Board's opinion,
>
> i. the project is unlikely to cause significant public concern, and
>
> ii. its adverse ecosystemic and socioeconomic impacts are unlikely to be significant, or are highly predictable and can be adequately mitigated by known technologies.

It is noted that under Article 12, Section 12.4.2(c) and s. 89(2) of the *NuPPAA* provides that the considerations set out in s.89(1)(a) prevail over the considerations set out in s. 89(1)(b) of the *NuPPAA*.

As set out under Article 12, Section 12.4.4 of the *Nunavut Agreement* and s. 92(1) of the *NuPPAA*, upon conclusion of the screening process, the Board must provide its written report the Minister. The contents of the NIRB's report are specified under *NuPPAA*:

NuPPAA, s. 92(1): The Board must submit a written report to the responsible Minister containing a description of the project that specifies its scope and indicating that:

(a) a review of the project is not required;

(b) a review of the project is required; or

(c) the project should be modified or abandoned.

Where the NIRB determines that a project may be carried out without a review, the NIRB has the discretion to recommend specific terms and conditions to be attached to any approval of the project proposal pursuant to paragraph 92(2)(a) of *NuPPAA* as follows:

NuPPAA, s. 92(2) In its report, the Board may also

(a) recommend specific terms and conditions to apply in respect of a project that it determines may be carried out without a review.

PROJECT REFERRAL

On December 3, 2018 the NIRB received a referral to screen the Government of Nunavut's (GN) "Undersea Fibre Optic Cable Installation" project proposal from the Nunavut Planning Commission (NPC or Commission), which noted that the project proposal is outside the area of an applicable regional land use plan.

Pursuant to Article 12, Sections 12.4.1 and 12.4.4 of the *Nunavut Agreement* and s. 87 of the *NuPPAA*, the NIRB commenced screening this project proposal and assigned it file number 18UN050.

PROJECT OVERVIEW & THE NIRB ASSESSMENT PROCESS

1. Information Requests and Suspension of Assessment

On December 3, 2018 the NIRB requested that the Proponent complete the online application form through the NIRB's public registry system and ensure, pursuant to s. 144(1) of the *NuPPAA*, that the information provided be sufficient to determine the scope of the project activities being proposed and that sufficient information has been provided to commence screening. On December 19, 2018 the NIRB received the required additional information and commenced the screening pursuant to Part 3 of the *NuPPAA*.

2. Project Scope

All documents received and pertaining to this project proposal can be accessed from the NIRB's online public registry at www.nirb.ca/project/125425.

The proposed "Undersea Fibre Optic Cable Installation" project is located within the Qikiqtani (South Baffin) region, involving an undersea fibre optic cable from Nuuk to Iqaluit, Kimmirut and Cape Dorset, and a separate cable from Sanikiluaq to Québec. The Proponent intends to conduct cable laying/installation, and construction of shore landings. The program is proposed to take place from May 2019 to December 2020.

As required under s. 86(1) of the *NuPPAA*, the Board accepts the scope of the "Undersea Fibre Optic Cable Installation" project as set out by the GN in the proposal. The scope of the project proposal includes the following undertakings, works, or activities:

- Laying of a main-trunk submarine cable from Nuuk to Iqaluit, Kimmirut, and Cape Dorset, with infrastructure to allow later expansion up the east coast of Baffin Island and into Hudson Bay;
- Laying of a submarine cable from Sanikiluaq to the Kativik Regional Government system in Nunavik;
- Transportation of light cargo material via air and heavier cargo material via sealift;
- Installation of cable via self-contained vessels;
    - Plough burial of cable or jetting of cable below sea bed and may include clearing obstacles;
    - Use of cableship to install cables with up to 80 personnel;
    - Use of two (2) or more shallow draft vessels or barges for shore-end cable installations at landing sites;
- Construction of landing sites in Iqaluit, Kimmirut, Cape Dorset, and Sanikiluaq;
    - Construction of concrete vaults to support cable tie-in points;
    - Rock cutting or drilling as required;
    - Use of vehicles for construction and personnel transport;
- Operation and maintenance of the submarine cable to include:
    - Transmission of light (data) and electrical power;
    - Use of maintenance vessels during ice free conditions to repair and/or replace any damaged cables;
- Anticipated in-place abandonment of cable at end of 25- to 30-year project lifespan; and
- Use of accommodations and local infrastructure.

Given the geographic applicability of Article 12 of the *Nunavut Agreement*, the NIRB's assessment considers only those aspects of the proposed project which are located within the Nunavut Settlement Area. The NIRB notes that additional components of the proposed project located outside of the Nunavut Settlement Area and within other Canadian jurisdictions are subject to the impact assessment processes of other authorities, including the following:

- Nunavik Marine Region Impact Review Board (Nunavik, Quebec); and
- Canadian Environmental Assessment Agency (Canadian waters beyond the Nunavut Settlement Area boundary).

3. Inclusion or Exclusion to Scoping List

The NIRB has identified no additional works or activities in relation to the project proposal. As a result, the NIRB proceeded with screening the project based on the scope as described above.

4. Key Stages of the Screening Process

The following key stages were completed:

Date	Stage
December 3, 2018	Receipt of project proposal and referral from the NPC
December 3, 2018	Information request(s)

Date	Stage
December 19, 2018	Proponent responded to information request(s)
December 19, 2018	Scoping pursuant to s. 86(1) of the *NuPPAA*
December 20, 2018	Public engagement and comment request
January 16, 2019	Receipt of public comments
January 31, 2019	Ministerial extension requested from the Minister of Intergovernmental Affairs and Northern Affairs and Internal Trade
February 19, 2019	Additional information received from Innovation, Science and Economic Development Canada

5. Public Comments and Concerns

Notice regarding the NIRB's screening of this project proposal was distributed on December 20, 2018 to community organizations in Iqaluit, Kimmirut, Cape Dorset, and Sanikiluaq, as well as to relevant federal and territorial government agencies, Inuit organizations and other parties. The NIRB requested that interested parties review the proposal and provide the Board with any comments or concerns by January 16, 2019 regarding:

- Whether the project proposal is likely to arouse significant public concern; and if so, why;
- Whether the project proposal is likely to cause significant adverse eco-systemic or socio-economic effects; and if so, why;
- Whether the project proposal is likely to cause significant adverse impacts on wildlife habitat or Inuit harvest activities; and if so, why;
- Whether the project proposal is of a type where the potential adverse effects are highly predictable and mitigable with known technology, (and providing any recommended mitigation measures); and
- Any matter of importance to the Party related to the project proposal.

On or before January 16, 2019 the NIRB received comments from the following interested parties (see Summary of Comments and Concerns section below):

- **Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)**
- **Environment and Climate Change Canada (ECCC)**
- **Fisheries and Oceans Canada (DFO)**

On February 19, 2019 the NIRB received comments from:

- **Innovation, Science and Economic Development Canada**

a. *Summary of Public Comments and Concerns Received during the Public comment period of this file*

The following provides a summary of the comments and concerns received by the NIRB:

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)

- Noted the Proponent did not provide a description of potential impacts of vessels and land-based equipment or mitigation measures.

- Noted the Proponent did not identify specific negative non-mitigable impacts on water, or explain why they were non-mitigable. It is unclear how the proponent intends to monitor negative effects to ensure they remain non-significant.
- Noted the Proponent did not provide information on fuel usage or spill contingency planning.
- Recommended to the NIRB terms and conditions related to refueling of equipment and spill response.

Environment and Climate Change Canada (ECCC)
- Noted that no disposal at sea for unused material will be required, however if disposal at sea is required, a Disposal at Sea permit application will be required.
- Noted the Belcher Islands is key habitat to migratory birds and areas which are polynyas in the winter are sensitive to contamination.
- Recommended the Proponent provide more details on when work will commence.
- Recommended polynyas and other open water areas be avoided.
- Recommended the Proponent follow ECCC's recommended setback distances to minimize disturbance to eiders and other sea ducks.

Fisheries and Oceans Canada (DFO)
- Indicated there was potential for serious harm to fish and fish habitat and/or Species at Risk and portions of the proposed project area are considered to be ecologically or biologically sensitive areas.
- Indicated there was insufficient information to determine if the proposal could result in serious harm to fish.
- Recommended the Proponent submit a Request for Review form to DFO.

Innovation, Science and Economic Development Canada
- Noted an International Submarine Cable Licence will be required.
- Noted that under the *Telecommunications Act* and the *International Submarine Cable Licence Regulations* an application for an International Submarine Cable Licence requires an assessment under the *Canadian Environmental Assessment Act 2012* (*CEAA 2012*) for projects if carried out on "federal lands" as (defined in the act), which may or may not be applicable to this proposed project.

b. Comments and Concerns with respect to Inuit Qaujimaningit, Traditional, and Community Knowledge

No concerns or comments were received with respect to Inuit Qaujimaningit or traditional and community knowledge in relation to the proposed project.

6. Time of Report Extension

As a result of the time required to allow more information on potential impacts and the applicable regulatory oversight for the project be submitted from regulators prior to the Board making its screening determination, the NIRB was not able to provide its screening decision report to the responsible Minister within 45 days as required by Article 12, Section 12.4.5 of the *Nunavut Agreement* and s. 92(3) of the *NuPPAA*. Therefore, on January 31, 2019 the NIRB wrote to the

Minister of Intergovernmental Affairs and Northern Affairs and Internal Trade, Government of Canada, seeking an extension to the 45-day timeline for the provision of the Board's Report.

ASSESSMENT OF THE PROJECT PROPOSAL IN ACCORDANCE WITH PART 3 OF *NUPPAA*

In determining whether a review of the project is required, the Board considered whether the project proposal had potential to result in significant ecosystemic or socio-economic impacts.

Accordingly, the assessment of impact significance was based on the analysis of those factors that are set out under s. 90 of the *NuPPAA*. The Board took particular care to take into account Inuit Qaujimaningit, traditional and community knowledge in carrying out its assessment and determination of the significance of impacts.

The following is a summary of the Board's assessment of the factors that are relevant to the determination of significant impacts with respect of this project proposal:

Factor	Comment
The size of the geographic area, including the size of wildlife habitats, likely to be affected by the impacts.	The submarine cable is proposed to be installed from Nuuk to Iqaluit, Kimmirut, and Cape Dorset, with a second cable from Sanikiluaq to Nunavik. A total of approximately 2,400 kilometers of cable would be laid on the sea floor. Each shore landing would consist of a buried concrete vault approximately 1 meter by 2 meters in area.
The ecosystemic sensitivity of that area.	No specific areas of ecosystemic sensitivity have been identified by the Proponent within the physical footprint of the proposed project. ECCC has identified the Belcher Islands as key habitat for migratory birds. DFO has indicated portions of the proposed project area are considered to be ecologically or biologically sensitive but did not provide further information to identify these areas. Marine areas in which the cable is proposed to be laid are used by marine mammals and Polar Bears, however Polar Bears are unlikely to be in those areas during the open-water season during the installation of the cable. Landing areas in Iqaluit, Kimmirut, and Cape Dorset are located within or adjacent to the

Factor	Comment
	communities and thus disturbance to habitat would be considered minimal.
The historical, cultural and archaeological significance of that area.	No specific areas of historical, cultural and archaeological significance have been identified by the Proponent within the physical footprint of the proposed project.
The size of the human and the animal populations likely to be affected by the impacts.	During construction and installation of the cable and shore landing sites, there is the potential for temporary impacts to the seafloor and nearshore marine habitat due to burying the cable, and to the terrestrial habitat from installation of the landing point vaults. Installation and construction activities have the potential to disrupt human activity in the area. The operational phase of the proposed project is unlikely to result in any physical impacts to human and animal populations.
The nature, magnitude and complexity of the impacts; the probability of the impacts occurring; the frequency and duration of the impacts; and the reversibility or irreversibility of the impacts.	A zone of influence of up to 10 km from the most potentially-disruptive project activities was selected for the NIRB's assessment. With adherence to the relevant regulatory requirements and application of the mitigation measures recommended by the NIRB, no significant residual effects are expected to occur.
The cumulative impacts that could result from the impacts of the project combined with those of any other project that has been carried out, is being carried out or is likely to be carried out.	The project is unlikely to have cumulative effects with other projects due to the localized nature and minimal disturbance of the landing points and submarine cable, brief period of installation activity, and the lack of physical effects during operations.
Any other factor that the Board considers relevant to the assessment of the significance of impacts.	The project would enhance communication linkages for Iqaluit, Kimmirut, Cape Dorset, Sanikiluaq, potentially lowering costs for residents and allowing access to high-speed data and telecommunications which would have positive socio-economic effects for those communities. The transfer of communications load to cable from satellite would provide increased bandwidth to other Nunavut communities connected only be satellite. The Cape Dorset to Nuuk section of the project would follow the approximate route within

Factor	Comment
	Nunavut previously approved by the Board for the proposed but not constructed Arctic Fibre Submarine Cable project (13UN035).

Other past, present and reasonably foreseeable projects considered in this assessment:

NIRB Project Number	Project Title	Project Type
Proposed Developments – approved but not constructed or active		
13UN035	Arctic Fibre Submarine Cable	Fibre optic marine cable
Present Projects – approved or in operation		
17XN021	Iqaluit Deep Sea Port	Infrastructure/Port
17XN022	Iqaluit Small Craft Harbour	Infrastructure/Dock

VIEWS OF THE BOARD

In considering the factors as set out above in the screening of the project proposal, the NIRB has identified a number of issues below and respectfully provide the following views regarding whether or not the proposed project has the potential to result in significant impacts. In addition, the NIRB has proposed terms and conditions that would mitigate the potential adverse impacts identified.

Ecosystem, wildlife habitat and Inuit harvesting activities:

- Potential negative impacts to marine species (including fish) and marine habitat within waters of the Nunavut Settlement Area through installation operations and disturbance to the seabed due to burying the cable and potential fuel spills from marine operations. Although the installation of the cable by burying in shallow water will disturb the seabed, habitat, and other marine species, the disturbance will be short term and involve narrow strips of the sea floor. In order to reduce the impact on marine wildlife and marine habitat, the Board is recommending terms and conditions 12 through 17, 23, 24, and 27. The Board is also recommending terms and conditions 11 and 22 to minimize potential harm from fuel spills during operations.

- Potential negative impacts to traditional marine use activities through disturbance by the operations of ship and barge during cable installation. The marine operations have the potential for interfering with traditional activities by disturbance of marine wildlife, however the disturbance will be short term, localized, transient, and limited to the open water season. The operation phase of the project after cable installation is not expected to have any impact on marine wildlife or marine activities. The Board is recommending terms and conditions 29 and 30 to minimize impacts on traditional marine activities.

- Potential negative impacts to wildlife and migratory birds including Eider ducks, during the construction of landing sites. Landing sites in Iqaluit, Cape Dorset, and Kimmirut will be located within built-up municipal areas and thus disturbance to migratory birds and

wildlife is anticipated to be minimal. The landing site in Sanikiluaq will be located outside the built-up area and has a greater chance of encountering wildlife and having potential negative effects. The landing points will involve the construction of small underground vaults and associated equipment and due to the minimal area necessary for construction, the disturbance is expected to be minor and mitigable with appropriate measures. In order to minimize impacts in wildlife, the Board is recommending terms and conditions 5, 6, 12 through 18, and 21.

- Potential negative impacts to water quality, freshwater fish and fish habitat, vegetation and soil due to ground disturbance during construction of landings, rock-cutting, or drilling activities to create routes from the underwater cable to the landing points. The Board is recommending terms and conditions 4, 7 through 11, 19, 20, 22, 25, 26, and 28 to minimize potential impacts on water and the land.

Socio-economic effects on northerners:

- Potential positive impacts to local economies through local hiring and contracting for construction of landing points. The Board is recommending term and condition 31 to encourage local hiring.

Significant public concern:

- No significant public concern was expressed during the public commenting period for this file. The NIRB has recommended terms and conditions 30 and 31 to ensure that project activities do not interfere with Inuit wildlife harvesting or traditional land use activities and to the extent hire local people and access local services where possible. Further, the NIRB is recommending term and condition 29 to ensure planned activities in the area utilizes available Inuit Qaujimaningit.

Technological innovations for which the effects are unknown:

- No specific issues have been identified associated with this project proposal.

Administrative Conditions:

To encourage compliance with applicable regulatory requirements and assist the Board and responsible authorities with compliance and effects monitoring for project activities, the following project-specific terms and conditions have been recommended: 1-3.

In considering the above factors and subject to the Proponent's compliance with the terms and conditions necessary to mitigate against the potential adverse environmental and social effects, the Board is of the view that the proposed project is unlikely to cause significant public concern and its adverse ecosystemic and socioeconomic impacts are unlikely to be significant, or are highly predictable and can be adequately mitigated by known technologies.

RECOMMENDED PROJECT-SPECIFIC TERMS AND CONDITIONS

The Board is recommending the following specific terms and conditions to apply in respect of the project:

General

1. The Government of Nunavut (the Proponent) shall maintain a copy of the Project Terms and Conditions at the site of operation at all times.
2. The Proponent shall operate in accordance with all commitments stated in correspondence provided to the Nunavut Planning Commission (NPC File No.: 148937) and the NIRB (Online Application Form, December 19, 2018).
3. The Proponent shall operate the site in accordance with all applicable Acts, Regulations and Guidelines.

Water Use

4. The Proponent shall not use water, including constructing or disturbing any stream, lakebed or the banks of any definable water course unless otherwise authorized by the Nunavut Water Board or Fisheries and Oceans Canada.

Waste Disposal

5. The Proponent shall keep all garbage and debris in bags placed in a covered metal container or equivalent until disposed of at an approved facility. All such wastes shall be kept inaccessible to wildlife at all times.

Fuel and Chemical Storage

6. The Proponent shall store all fuel and chemicals in such a manner that they are inaccessible to wildlife.
7. The Proponent shall locate all fuel and other hazardous materials a minimum of thirty-one (31) metres away from the high water mark of any water body and in such a manner as to prevent their release into the environment unless otherwise authorized by the Nunavut Water Board.
8. The Proponent shall ensure that re-fueling of all equipment occurs a minimum of thirty-one (31) metres away from the high water mark of any water body unless otherwise authorized by the Nunavut Water Board.
9. The Proponent shall ensure that appropriate spill response equipment and clean-up materials (e.g., shovels, pumps, barrels, drip pans, and absorbents) are readily available during any transfer of fuel or hazardous substances, at all fuel storage sites, at all refuelling stations, at vehicle maintenance areas and at drill sites.
10. The Proponent shall remove and treat hydrocarbon contaminated soils on site or transport them to an approved disposal site for treatment.
11. The Proponent shall ensure that all personnel are properly trained in fuel and hazardous waste handling procedures, as well as spill response procedures. All spills of fuel or other deleterious materials of any amount must be reported immediately to the 24 hour Spill Line at (867) 920-8130.

Wildlife - General

12. The Proponent shall ensure that there is no damage to wildlife habitat in conducting this operation.

13. The Proponent shall not harass wildlife. This includes persistently circling, chasing, hovering over pursuing or in any other way harass wildlife, or disturbing large groups of animals.
14. The Proponent shall not hunt or fish, unless proper Nunavut authorizations have been acquired.
15. The Proponent shall ensure that all project personnel are made aware of the measures to protect wildlife and are provided with training and/or advice on how to implement these measures.

Migratory Birds and Raptors Disturbance

16. The Proponent shall not disturb or destroy the nests or eggs of any birds. If nests are encountered and/or identified, the Proponent shall take precaution to avoid further interaction and or disturbance (e.g., a 100 metres buffer around the nests). If active nests of any birds are discovered (i.e., with eggs or young), the Proponent shall avoid these areas until nesting is complete and the young have left the nest.
17. The Proponent shall minimize activities during periods when birds are particularly sensitive to disturbance such as migration, nesting and moulting.
18. The Proponent shall avoid the seaward site of seabird colonies and areas used by flocks of migrating waterfowl by three (3) kilometres.

Ground Disturbance

19. The Proponent shall not move any equipment or vehicles unless the ground surface is in a state capable of fully supporting the equipment or vehicles without rutting or gouging. Overland travel of equipment or vehicles must be suspended if rutting occurs.
20. The Proponent shall implement suitable dust, erosion and sediment suppression measures on all areas before, during and after conducting activities in order to prevent sediments or fugitive dust from entering any waterbody or surrounding environment.
21. All construction and road vehicles must be fitted with standard and well-maintained noise suppression devices and engine idling is to be minimized

Marine-based Activities

22. The Proponent shall not deposit, nor permit the deposit of any fuel, chemicals, wastes (including waste water) or sediment into any marine waters.
23. The Proponent shall suspend all project activities should any dead fish or wildlife, or any injured wildlife be observed during any works or activities in and around the marine waters.
24. The Proponent shall implement measures designed to minimize disturbance to seabed sediments and benthic communities and marine wildlife when carrying out project activities within the marine environment.
25. The Proponent shall implement suitable erosion and sediment suppression measures on all areas before, during and after conducting activities in order to minimize turbidity plumes from the work site into the waterbody including the installation of silt screens.
26. Construction shall be carried out during periods when wind, wave and tidal conditions minimize the dispersion of silt and sediment from the work site.
27. The Proponent shall manage all wastes (including domestic, garbage and debris) on board the vessel prior to final disposal at approved port facilities.

Restoration of Disturbed Areas

28. The Proponent shall remove all garbage, fuel and equipment upon abandonment.

Other

29. The Proponent should engage with local residents regarding planned activities in the area and should solicit available Inuit Qaujimaningit and information regarding current recreational and traditional usage of the project area which may inform project activities. Posting of translated public notices and direct engagement with potentially interested groups and individuals prior to undertaking project activities is strongly encouraged.
30. The Proponent shall ensure that project activities do not interfere with Inuit wildlife harvesting or traditional land use activities.
31. The Proponent should, to the extent possible, hire local people and access local services where possible.

MONITORING AND REPORTING REQUIREMENTS

In addition, the Board is recommending the following:

Wildlife Mitigation and Monitoring Plan

1. Prior to the start of project activities, the Proponent shall submit an updated Wildlife Mitigation and Monitoring Plan (WMMP) to the Nunavut Impact Review Board, Government of Nunavut Department of Environment and the Department of Fisheries and Oceans. At a minimum, this plan should include proposed template for a wildlife log/record of observations and proposed mitigation measures for migratory birds, Polar Bear, and other sensitive species that may be encountered within the project area. The Proponent is encouraged to consult with the Government of Nunavut's Regional Biologists during the revision of the WMMP, regarding project schedule and timelines so as to ensure adequate mitigation of potential wildlife impacts.

Spill Contingency Plan

2. The Proponent shall update its Spill Contingency Plan to include the up to date emergency contact numbers for the Government of Nunavut-Department of Environment, Manager of Environmental Protection (867-975-7748) and Environment and Climate Change Canada, Enforcement Branch (867-975-4644).

OTHER NIRB CONCERNS AND RECOMMENDATIONS

In addition to the project-specific terms and conditions, the Board is recommending the following:

Change in Project Scope

1. Responsible authorities or Proponent shall notify the Nunavut Planning Commission and the NIRB of any changes in operating plans or conditions, including phase advancement, associated with this project prior to any such change.

Copy of licences, etc. to the Board and Commission

2. As per s. 137(4) of the *NuPPAA*, responsible authorities are required to submit a copy of each licence, permit or other authorization issued for the Project to the Nunavut Planning

Commission and the NIRB. Please forward a copy of the licences, permits and/or other authorizations to the NIRB directly at info@nirb.ca or upload a copy to the NIRB's online registry at www.nirb.ca.

Bear and Carnivore Safety

3. The Proponent should review the Government of Nunavut's booklet on Bear Safety, which can be downloaded from this link: http://gov.nu.ca/sites/default/files/bear_safety_-_reducing_bear-people_conflicts_in_nunavut.pdf. Further information on bear/carnivore detection and deterrent techniques can be found in the "*Safety in Grizzly and Black Bear Country*" pamphlet, which can be downloaded from this link: http://www.enr.gov.nt.ca/sites/default/files/web_pdf_wd_bear_safety_brochure_1_may_2015.pdf.
4. There are polar bear and grizzly bear safety resources available from the Bear Smart Society with videos on polar bear safety available in English, French and Inuktitut at http://www.bearsmart.com/play/safety-in-polar-bear-country/. Information can also be obtained from Parks Canada's website on bear safety at the following link: http://www.pc.gc.ca/eng/pn-np/nu/quttinirpaaq/visit/visit6/d.aspx or in reviewing the "*Safety in Polar Bear Country*" pamphlet, which can be downloaded from the following link: *http://www.pc.gc.ca/eng/pn-np/nu/quttinirpaaq/visit/visit6/~/media/pn-np/nu/auyuittuq/pdf/shared/PolarBearSafety_English.ashx*.
5. Any problem wildlife or any interaction with carnivores should be reported immediately to the local Government of Nunavut, Department of Environment Conservation Office (Conservation Officer of Iqaluit, phone: 867-924-6235; Kimmirut, phone: 867-980-4520; Cape Dorset, phone: 867-975-6407; Sanikiluaq, phone: 867-975-7783).

Species at Risk

6. The Proponent review Environment and Climate Change Canada's "Environment Assessment Best Practice Guide for Wildlife at Risk in Canada", available at the following link: http://www.sararegistry.gc.ca/virtual_sara/files/policies/EA%20Best%20Practices%202004.pdf. The guide provides information to the Proponent on what is required when Wildlife at Risk, including *Species at Risk*, are encountered or affected by the project.

Migratory Birds

7. The Proponent review Canadian Wildlife Services' "Key migratory bird terrestrial habitat sites in the Northwest Territories and Nunavut", available at the following link: http://publications.gc.ca/site/eng/317630/publication.html and "Key marine habitat sites for migratory birds in Nunavut and the Northwest Territories", available at the following link: http://publications.gc.ca/site/eng/392824/publication.html. The guide provides information to the Proponent on key terrestrial and marine habitat areas that are essential to the welfare of various migratory bird species in Canada.
8. For further information on how to protect migratory birds, their nests and eggs when planning or carrying out project activities, consult Environment and Climate Change Canada's Incidental Take web page and the fact sheet "Planning Ahead to Reduce the Risk of Detrimental Effects to Migratory Birds, and their Nests and Eggs" available at http://www.ec.gc.ca/paom-itmb/.

Transport of Dangerous Goods and Waste Management

9. Environment and Climate Change Canada recommends that all hazardous wastes, including waste oil, receive proper treatment and disposal at an approved facility.
10. The Proponent shall provide an authorization or letter of conformation of disposal be obtained from the owner/operator of the landfill to be used for disposal of project-related wastes.

Crown-Indigenous Relations and Northern Affairs Canada

11. Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) impose mitigation measures, conditions and monitoring requirements pursuant to the Federal Land Use Permit, which require the Proponent to respect the sensitivities and importance of the area. These mitigation measures, conditions and monitoring requirements should be in regard to the location and area; type, location, capacity and operation of facilities; use, storage, handling and disposal of chemical or toxic material; wildlife and fisheries habitat; and petroleum fuel storage.

Nunavut Water Board

12. The Nunavut Water Board impose mitigation measures, conditions and monitoring requirements pursuant to the Water Licence, which require the Proponent to respect the sensitivities and importance of water in the area. These mitigation measures, conditions and monitoring requirements should be in regard to use of water, snow and ice; waste disposal; access infrastructure and operation for camps; drilling operations; spill contingency planning; abandonment and restoration planning; and monitoring programs.

REGULATORY REQUIREMENTS

The Proponent is also advised that the following legislation may apply to the project:

Acts and Regulations

1. The *Fisheries Act* (http://laws-lois.justice.gc.ca/eng/acts/F-14/index.html).
2. The *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (http://laws-lois.justice.gc.ca/eng/acts/n-28.8/).
3. The *Migratory Birds Convention Act* and *Migratory Birds Regulations* (http://laws-lois.justice.gc.ca/eng/acts/M-7.01/).
4. The *Species at Risk Act* (http://laws-lois.justice.gc.ca/eng/acts/S-15.3/index.html). Attached in **Appendix A** is a list of Species at Risk in Nunavut.
5. The *Wildlife Act (Nunavut)* and its corresponding regulations (http://www.canlii.org/en/nu/laws/stat/snu-2003-c-26/latest/snu-2003-c-26.html).
6. The *Nunavut Act* (http://laws-lois.justice.gc.ca/eng/acts/N-28.6/). The Proponent must comply with the proposed terms and conditions listed in the attached **Appendix B**.
7. The *Arctic Waters Pollution Prevention Act* (http://laws-lois.justice.gc.ca/eng/acts/A-12/).
8. The *Canada Shipping Act, 2001* (http://laws-lois.justice.gc.ca/eng/acts/C-10.15/).
9. The *Marine Liability Act* (http://laws-lois.justice.gc.ca/eng/acts/M-0.7/).

10. The *Navigation Protection Act* (http://laws-lois.justice.gc.ca/eng/acts/N-22/index.html).
11. The *Telecommunications Act* (https://laws-lois.justice.gc.ca/eng/acts/t-3.4/).
12. *International Submarine Cable Licences Regulations* (https://laws-lois.justice.gc.ca/eng/regulations/SOR-98-488/).

Other Applicable Guidelines

13. The *Guidance Document for Passenger Vessels Operating in the Canadian Arctic* (https://www.tc.gc.ca/eng/marinesafety/tp-tp13670-menu-2315.htm).
14. Environmental Guideline for the General Management of Hazardous Waste, Government of Nunavut, Revised October 2010 (https://www.gov.nu.ca/sites/default/files/Guideline%20-%20General%20Management%20of%20Hazardous%20Waste%20%28revised%20Oct%202010%29_0.pdf).

CONCLUSION

The foregoing constitutes the Board's screening decision with respect to the Government of Nunavut's "Undersea Fibre Optic Cable Installation"". The NIRB remains available for consultation with the Minister regarding this report as necessary.

Dated February 28, 2019 at Whale Cove, NU.

[redacted]

Elizabeth Copland, Chairperson

Attachments: Appendix A: Species at Risk in Nunavut
Appendix B: Archaeological and Palaeontological Resources Terms and Conditions for Land Use Permit Holders

APPENDIX A: SPECIES AT RISK IN NUNAVUT

Due to the requirements of Section 79(2) of the Species at Risk Act (SARA), and the potential for project-specific adverse effects on listed wildlife species and its critical habitat, measures should be taken as appropriate to avoid or lessen those effects, and the effects need to be monitored. Project effects could include species disturbance, attraction to operations and destruction of habitat. This section applies to all species listed on Schedule 1 of SARA, as listed in the table below, or have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which may be encountered in the project area. This list may not include all species identified as at risk by the Territorial Government. The following points provide clarification on the applicability of the species outlined in the table.

- Schedule 1 is the official legal list of Species at Risk for SARA. SARA applies to all species on Schedule 1. The term "listed" species refers to species on Schedule 1.
- Schedule 2 and 3 of SARA identify species that were designated at risk by the COSEWIC prior to October 1999 and must be reassessed using revised criteria before they can be considered for addition to Schedule 1.
- Some species identified at risk by COSEWIC are "pending" addition to Schedule 1 of SARA. These species are under consideration for addition to Schedule 1, subject to further consultation or assessment.

If species at risk are encountered or affected, the primary mitigation measure should be avoidance. The Proponent should avoid contact with or disturbance to each species, its habitat and/or its residence. All direct, indirect, and cumulative effects should be considered. Refer to species status reports and other information on the species at risk Registry at http://www.sararegistry.gc.ca for information on specific species.

Monitoring should be undertaken by the Proponent to determine the effectiveness of mitigation and/or identify where further mitigation is required. As a minimum, this monitoring should include recording the locations and dates of any observations of species at risk, behaviour or actions taken by the animals when project activities were encountered, and any actions taken by the proponent to avoid contact or disturbance to the species, its habitat, and/or its residence. This information should be submitted to the appropriate regulators and organizations with management responsibility for that species, as requested.

For species primarily managed by the Territorial Government, the Territorial Government should be consulted to identify other appropriate mitigation and/or monitoring measures to minimize effects to these species from the project.

Mitigation and monitoring measures must be undertaken in a way that is consistent with applicable recovery strategies and action/management plans.

Schedules of SARA are amended on a regular basis so it is important to check the SARA registry (www.sararegistry.gc.ca) to get the current status of a species.

Updated: November 2018

Terrestrial Species at Risk[1]	COSEWIC Designation	Schedule of SARA	Government Organization with Primary Management Responsibility[2]
Migratory Birds			
Buff-breasted Sandpiper	Special Concern	Schedule 1	Environment and Climate Change Canada (ECCC)
Common Nighthawk	Threatened	Schedule 1	ECCC
Eskimo Curlew	Endangered	Schedule 1	ECCC
Harlequin Duck	Special Concern	Schedule 1	ECCC
Harris's Sparrow	Special Concern	Schedule 1	ECCC
Horned Grebe	Special Concern	Schedule 1	ECCC
Ivory Gull	Endangered	Schedule 1	ECCC
Olive-sided Flycatcher	Special Concern	Schedule 1	ECCC
Red Knot Islandica Subspecies	Special Concern	Schedule 1	ECCC
Red-necked Phalarope	Special Concern	No Schedule	ECCC
Ross's Gull	Threatened	Schedule 1	ECCC
Rusty Blackbird	Special Concern	Schedule 1	ECCC
Short-eared Owl	Special Concern	Schedule 1	ECCC
Vegetation			
Porsild's Bryum	Threatened	Schedule 1	Government of Nunavut (GN)
Arthropods			
Transverse Lady Beetle	Special Concern	No Schedule	GN
Terrestrial Wildlife			
Caribou (Dolphin and Union Population)	Endangered	Schedule 1	GN
Caribou (Barren-ground Population)	Threatened	No Schedule	GN
Caribou (Torngat Mountains Population)	Endangered	No Schedule	GN
Grizzly Bear (Western Population)	Special Concern	Schedule 1	GN
Peary Caribou	Threatened	Schedule 1	GN
Polar Bear	Special Concern	Schedule 1	GN
Wolverine	Special Concern	Schedule 1	GN
Marine Wildlife			
Atlantic Walrus (High Arctic Population)	Special Concern	No Schedule	Fisheries and Oceans Canada (DFO)
Atlantic Walrus (Central/Low Arctic Population)	Special Concern	No Schedule	DFO
Beluga Whale (Cumberland Sound Population)	Threatened	Schedule 1	DFO
Beluga Whale (Eastern Hudson Bay Population)	Endangered	No Schedule	DFO
Beluga Whale (Eastern High Arctic-Baffin Bay Population)	Special Concern	No Schedule	DFO

1 The Department of Fisheries and Oceans has responsibility for aquatic species.

2 Environment and Climate Change Canada (ECCC) has a national role to play in the conservation and recovery of Species at Risk in Canada, as well as responsibility for management of birds described in the Migratory Birds Convention Act (MBCA). Day-to-day management of terrestrial species not covered in the MBCA is the responsibility of the Territorial Government. Populations that exist in National Parks are also managed under the authority of the Parks Canada Agency.

Terrestrial Species at Risk[1]	COSEWIC Designation	Schedule of SARA	Government Organization with Primary Management Responsibility[2]
Beluga Whale (Western Hudson Bay Population)	Special Concern	No Schedule	DFO
Fish			
Atlantic Cod (Arctic Lakes Population)	Special Concern	No Schedule	DFO
Fourhorn Sculpin (Freshwater Form)	Data Deficient	Schedule 3	DFO
Lumpfish	Threatened	No Schedule	DFO
Thorny Skate	Special Concern	No Schedule	DFO

APPENDIX B: ARCHAEOLOGICAL AND PALAEONTOLOGICAL RESOURCES TERMS AND CONDITIONS FOR LAND USE PERMIT HOLDERS

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Nunavut

INTRODUCTION

The Department of Culture and Heritage (CH) routinely reviews land use applications sent to the Nunavut Water Board, Nunavut Impact Review Board and the Indigenous and Northern Affairs Canada. These terms and conditions provide general direction to the permittee/proponent regarding the appropriate actions to be taken to ensure the permittee/proponent carries out its role in the protection of Nunavut's archaeological and palaeontological resources.

TERMS AND CONDITIONS

1) The permittee/proponent shall have a professional archaeologist and/or palaeontologist perform the following **Functions** associated with the **Types of Development** listed below or similar development activities:

	Types of Development (See Guidelines below)	**Function** (See Guidelines below)
a)	Large scale prospecting	Archaeological/Palaeontological Overview Assessment
b)	Diamond drilling for exploration or geotechnical purpose or planning of linear disturbances	Archaeological/ Palaeontological Inventory
c)	Construction of linear disturbances, Extractive disturbances, Impounding disturbances and other land disturbance activities	Archaeological/ Palaeontological Inventory or Assessment or Mitigation

Note that the above-mentioned functions require either a Nunavut Archaeologist Permit or a Nunavut Palaeontologist Permit. CH is authorized by way of the *Nunavut and Archaeological and Palaeontological Site Regulations*[3] to issue such permits.

[3] P.C. 2001-1111 14 June, 2001

2) The permittee/proponent shall not operate any vehicle over a known or suspected archaeological or palaeontological site.

3) The permittee/proponent shall not remove, disturb, or displace any archaeological artifact or site, or any fossil or palaeontological site.

4) The permittee/proponent shall immediately contact CH at (867) 934-2046 or (867) 975-5500 should an archaeological site or specimen, or a palaeontological site or fossil, be encountered or disturbed by any land use activity.

5) The permittee/proponent shall immediately cease any activity that disturbs an archaeological or palaeontological site encountered during the course of a land use operation until permitted to proceed with the authorization of CH.

6) The permittee/proponent shall follow the direction of CH in restoring disturbed archaeological or palaeontological sites to an acceptable condition. If these conditions are attached to either a Class A or B Permit under the Territorial Lands Act Indigenous and Northern Affairs Canada directions will also be followed.

7) The permittee/proponent shall provide all information requested by CH concerning all archaeological sites or artifacts and all palaeontological sites and fossils encountered in the course of any land use activity.

8) The permittee/proponent shall make best efforts to ensure that all persons working under its authority are aware of these conditions concerning archaeological sites and artifacts and palaeontological sites and fossils.

9) If a list of recorded archaeological and/or palaeontological sites is provided to the permittee/proponent by CH as part of the review of the land use application the permittee/proponent shall avoid the archaeological and/or palaeontological sites listed.

10) Should a list of recorded sites be provided to the permittee/proponent, the information is provided solely for the purpose of the proponent's land use activities as described in the land use application, and must otherwise be treated confidentially by the proponent.

Legal Framework

As stated in Article 33 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*):

Where an application is made for a land use permit in the Nunavut Settlement Area, and there are reasonable grounds to believe that there could be sites of archaeological importance on the lands affected, no land use permit shall be issued without written consent of the Designated Agency. Such consent shall not be unreasonably withheld. [33.5.12]

Each land use permit referred to in Section 33.5.12 shall specify the plans and methods of archeological site protection and restoration to be followed by the permit holder, and any other conditions the Designated Agency may deem fit. [33.5.13]

Palaeontology and Archaeology
Under the *Nunavut Act*[4], the federal government can make regulations for the protection, care and preservation of palaeontological and archaeological sites and specimens in Nunavut. Under the *Nunavut Archaeological and Palaeontological Sites Regulations*[5], it is illegal to alter or disturb any palaeontological or archaeological site in Nunavut unless permission is first granted through the permitting process.

Definitions
As defined in the *Nunavut Archaeological and Palaeontological Sites Regulations*, the following definitions apply:

> *"archaeological site" means a place where an archaeological artifact is found.*
>
> *"archaeological artifact" means any tangible evidence of human activity that is more than 50 years old and in respect of which an unbroken chain of possession or regular pattern of usage cannot be demonstrated, and includes a Denesuline archaeological specimen referred to in section 40.4.9 of the Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada (Nunavut Agreement).*
>
> *"palaeontological site" means a site where a fossil is found.*
>
> *"fossil" includes:*
> *Fossil means the hardened or preserved remains or impression of previously living organisms or vegetation and includes:*
> *(a) natural casts;*
> *(b) preserved tracks, coprolites and plant remains; and*
> *(c) the preserved shells and exoskeletons of invertebrates and the preserved eggs, teeth and bones of vertebrates.*

Guidelines for Developers for the Protection of Archaeological Resources in the Nunavut Territory

(**Note:** Partial document only, complete document at: www.ch.gov.nu.ca/en/Archaeology.aspx)

Introduction
The following guidelines have been formulated to ensure that the impacts of proposed developments upon heritage resources are assessed and mitigated before ground surface altering activities occur. Heritage resources are defined as, but not limited to, archaeological and historical sites, burial grounds, palaeontological sites, historic buildings and cairns Effective collaboration between the developer, the Department of Culture, and Heritage (CH), and the contract archaeologist(s) will ensure proper preservation of heritage resources in the Nunavut Territory. The roles of each are briefly described.

CH is the Nunavut Government agency which oversees the protection and management of heritage resources in Nunavut, in partnership with land claim authorities, regulatory agencies, and

[4] s. 51(1)
[5] P.C. 2001-1111 14 June, 2001

the federal government. Its role in mitigating impacts of developments on heritage resources is as follows: to identify the need for an impact assessment and make recommendations to the appropriate regulatory agency; set the terms of reference for the study depending upon the scope of the development; suggest the names of qualified individuals prepared to undertake the study to the developer; issue an archaeologist or palaeontologist permit authorizing field work; assess the completeness of the study and its recommendations; and ensure that the developer complies with the recommendations.

The primary regulatory agencies that CH provides information and assistance to are the Nunavut Impact Review Board, for development activities proposed for Inuit Owned Lands (as defined in Section 1.1.1 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*)), and the Indigenous and Northern Affairs Canada, for development activities proposed for federal Crown Lands.

A developer is the initiator of a land use activity. It is the obligation of the developer to ensure that a qualified archaeologist or palaeontologist is hired to perform the required study and that provisions of the contract with the archaeologist or palaeontologist allow permit requirements to be met; i.e. fieldwork, collections management, artifact and specimen conservation, and report preparation. On the recommendation of the contract archaeologist or palaeontologist in the field and the Government of Nunavut, the developer shall implement avoidance or mitigative measures to protect heritage resources or to salvage the information they contain through excavation, analysis, and report writing. The developer assumes all costs associated with the study in its entirety.

Through his or her active participation and supervision of the study, the contract archaeologist or palaeontologist is accountable for the quality of work undertaken and the quality of the report produced. Facilities to conduct fieldwork, analysis, and report preparation should be available to this individual through institutional, agency, or company affiliations. Responsibility for the curation of objects recovered during field work while under study and for documents generated in the course of the study as well as remittance of artifacts, specimens and documents to the repository specified on the permit accrue to the contract archaeologist or palaeontologist. This individual is also bound by the legal requirements of the *Nunavut Archaeological and Palaeontological Sites Regulations*.

Types of Development

In general, those developments that cause concern for the safety of heritage resources will include one or more of the following kinds of surface disturbances. These categories, in combination, are comprehensive of the major kinds of developments commonly proposed in Nunavut. For any single development proposal, several kinds of these disturbances may be involved

- *Linear disturbances: including the construction of highways, roads, winter roads, transmission lines, and pipelines;*
- *Extractive disturbances: including mining, gravel removal, quarrying, and land filling;*
- *Impoundment disturbances: including dams, reservoirs, and tailings ponds;*

- *Intensive land use disturbances: including industrial, residential, commercial, recreational, and land reclamation work, and use of heritage resources as tourist developments.*

- *Mineral, oil and gas exploration: establishment of camps, temporary airstrips, access routes, well sites, or quarries all have potential for impacting heritage resources.*

Types of Studies Undertaken to Preserve Heritage Resources
Overview: An overview study of heritage resources should be conducted at the same time as the development project is being designed or its feasibility addressed. They usually lack specificity with regard to the exact location(s) and form(s) of impact and involve limited, if any, field surveys. Their main aim is to accumulate, evaluate, and synthesize the existing knowledge of the heritage of the known area of impact. The overview study provides managers with baseline data from which recommendations for future research and forecasts of potential impacts can be made. A Class I Permit is required for this type of study if field surveys are undertaken.

Reconnaissance: This is done to provide a judgmental appraisal of a region sufficient to provide the developer, the consultant, and government managers with recommendations for further development planning. This study may be implemented as a preliminary step to inventory and assessment investigations except in cases where a reconnaissance may indicate a very low or negligible heritage resource potential. Alternately, in the case of small-scale or linear developments, an inventory study may be recommended and obviate the need for a reconnaissance.

The main goal of a reconnaissance study is to provide baseline data for the verification of the presence of potential heritage resources, the determination of impacts to these resources, the generation of terms of reference for further studies and, if required, the advancement of preliminary mitigative and compensatory plans. The results of reconnaissance studies are primarily useful for the selection of alternatives and secondarily as a means of identifying impacts that must be mitigated after the final siting and design of the development project. Depending on the scope of the study, a Class 1 or Class 2 Permit is required for this type of investigation.

Inventory: A resource inventory is generally conducted at that stage in a project's development at which the geographical area(s) likely to sustain direct, indirect, and perceived impacts can be well defined. This requires systematic and intensive fieldwork to ascertain the effects of all possible and alternate construction components on heritage resources. All heritage sites must be recorded on Government of Nunavut Site Survey forms. Sufficient information must be amassed from field, library and archival components of the study to generate a predictive model of the heritage resource base that will:

- allow the identification of research and conservation opportunities;
- enable the developer to make planning decisions and recognize their likely effects on the known or predicted resources; and
- make the developer aware of the expenditures, which may be required for subsequent studies and mitigation. A Class 1 or 2 permit is required.

Assessment: At this stage, sufficient information concerning the numbers and locations of heritage resources will be available, as well as data to predict the forms and magnitude of impacts. Assessments provide information on the size, volume, complexity and content of a heritage resource, which is used to rank the values of different sites or site types given current archaeological knowledge. As this information will shape subsequent mitigation program(s), great care is necessary during this phase.

Mitigation: This refers to the amelioration of adverse impacts to heritage resources and involves the avoidance of impact through the redesign or relocation of a development or its components; the protection of the resource by constructing physical facilities; or, the scientific investigation and recovery of information from the resource by excavation or other method. The type(s) of appropriate mitigative measures are dictated by their viability in the context of the development project. Mitigation strategies must be developed in consultation with, and approved by, the Department of Culture and Heritage. It is important to note that mitigation activities should be initiated as far in advance of the construction of the development as possible.

Surveillance and monitoring: These may be required as part of the mitigation program.

Surveillance may be conducted during the construction phase of a project to ensure that the developer has complied with the recommendations.

Monitoring involves identification and inspection of residual and long-term impacts of a development (i.e. shoreline stability of a reservoir); or the use of impacts to disclose the presence of heritage resources, for example, the uncovering of buried sites during the construction of a pipeline.

ATIA - 16(2)

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: March 6, 2019 10:05 AM
To: Djordjevic, Ana (INFC); Antinucci, Andrew (INFC); McCallum, Robert (INFC); Trottier-Abbott, Catherine (INFC); Brown, Tim; Hudson2, Sam (INFC)
Cc: Barry Reimer
Subject: RE: NU Fibre Project Discussion

Yup. We just found that out…LOL

-----Original Appointment-----
From: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>
Sent: March 6, 2019 10:03 AM
To: Antinucci, Andrew (INFC); McCallum, Robert (INFC); Trottier-Abbott, Catherine (INFC); Casson, Linda; Brown, Tim; Hudson2, Sam (INFC)
Cc: Barry Reimer
Subject: NU Fibre Project Discussion
When: March 6, 2019 10:00 AM-11:00 AM (UTC-05:00) Eastern Time (US & Canada).
Where: INFC CONF Ott-180Kent-09-001 CONF INFC

HI ALL – APOLOGIES – THE CONFERENCE NUMBER IS IN USE. GIVE US A MINUTE PLEASE

Bi-weekly (for now) discussion to follow-up on pressing issues regarding the Undersea Fibre Optic Cable Installation Linking Greenland, Nunavut and Quebec (NU ICIP) project.

Call in information:

Local call-in number: 613-960-7610
Toll-free call-in number: 1-877-413-4781
Conference code: [redacted]

Antinucci, Andrew (INFC)

From: Djordjevic, Ana (INFC)
Sent: March 7, 2019 9:38 AM
To: Antinucci, Andrew (INFC); McCallum, Robert (INFC)
Subject: FW: Urgent - Direction needed on key questions

Importance: High

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: March 6, 2019 8:27 PM
To: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>
Cc: Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: Urgent - Direction needed on key questions
Importance: High

Good morning, Ana

We are heading into a DM level steering committee meeting at 1 pm on March 7, and we urgently need definitive direction on these following questions. These directions will be pivotal in the decisions made by the group.

[redacted]

ATIA - 14 | ATIA - 21(1)(b)

[redacted]

Thanks so much and I'll be following up early in the morning to clarify any of these questions.

Qujannamiik/Merci/Thank You

Linda Casson

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Manager, Infrastructure Programs
Department of Community and Government Services
Government of Nunavut

Atanguyaq, Nunalaaniituni
Tunngavikhaliqiyunut
Nunalingni Kavamatkunnilu
Pivikhaqautikkut
Nunavut Kavamanga

Gestionnaire, programmes d'Infrastructure
Ministère des Services communautaires et gouvernementaux,
Gouvernement du Nunavut

☎ 867-975-5336
✉ lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

ATIA - 21(1)(b)

ATIA - 14

McCallum, Robert (INFC)

From:	Casson, Linda <LCasson@GOV.NU.CA>
Sent:	March 12, 2019 3:09 PM
To:	McCallum, Robert (INFC); Djordjevic, Ana (INFC); Antinucci, Andrew (INFC)
Subject:	RE: follow up question

Thank you so much, Robert, for your very helpful responses. We shall keep on pursuing the goal and see where it takes us.!

Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336

lcasson@gov.nu.ca

Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: March 11, 2019 2:29 PM
To: Casson, Linda <LCasson@GOV.NU.CA>; Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: RE: follow up question

Hi Linda: my responses are below.

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: March 7, 2019 4:27 PM
To: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: follow up question

The Steering Committee for the Fibre project met today and I was asked to check on the implications of the following:

[redacted]

1. [redacted]

ATIA - 19(1) ATIA - 21(1)(a)
ATIA - 14 ATIA - 21(1)(b)

[redacted]

I'll be in touch if our SR management would like a call.

Linda
Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: March 7, 2019 1:47 PM
To: Casson, Linda <LCasson@GOV.NU.CA>; Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: RE: Quick chat

No problem. We appreciate you bringing your concerns to us so promptly. Let us know if a more-senior level call would help.

Rob

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: March 7, 2019 11:07 AM
To: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: RE: Quick chat

Thank you so much, Rob and team
This will give us some concrete reference points. I've also sent a note up that a DG or ADM call could be arranged on this matter.

I very much appreciate your work on this.

Qujannamiik/Merci/Thank You

Linda Casson

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Manager, Infrastructure Programs
Department of Community and Government Services
Government of Nunavut

Atanguyaq, Nunalaaniituni Tunngavikhaliqiyunut
Nunalingni Kavamatkunnilu Pivikhaqautikkut
Nunavut Kavamanga

Gestionnaire, programmes d'Infrastructure
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✉ lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: March 7, 2019 11:03 AM
To: Casson, Linda <LCasson@GOV.NU.CA>; Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: RE: Quick chat

Hi Linda. Here are some very quick responses. I will not be definitive as so much depends on specifics.

ATIA - 14

ATIA - 21(1)(a)

ATIA - 21(1)(b)

[redacted]

Rob

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: March 7, 2019 9:53 AM
To: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: RE: Quick chat

My phone number is 867-975-5336
And thanks for squeezing me in.

-----Original Appointment-----
From: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>
Sent: March 7, 2019 9:50 AM
To: Djordjevic, Ana (INFC); Antinucci, Andrew (INFC); McCallum, Robert (INFC); Casson, Linda
Subject: Quick chat

When: March 7, 2019 10:00 AM-11:00 AM (UTC-05:00) Eastern Time (US & Canada).
Where: INFC CONF Ott-180Kent-09-012 CONF INFC

ATIA - 14

ATIA - 21(1)(b)

McCallum, Robert (INFC)

From:	McCallum, Robert (INFC)
Sent:	March 15, 2019 5:03 PM
To:	Linda Casson
Cc:	INFC|INFC (andrew.antinucci@canada.ca); Djordjevic, Ana (INFC)
Subject:	Response Table
Attachments:	NU Fibre Project - Question-Response Table - 2019-03-15.docx

Hi Linda

Attached is a table which we'd like to start using as a repository of project information. Some of this information you've provided already, and you'll note that some of these questions were asked in our recent teleconferences. By putting the responses in a single location, we'll have your most-current responses in one place. If there are supporting documents, please provide them and note the filename in your response.

We expect we'll be adding more questions as we work through the project. This will help you build up a robust Business Case we'll ultimately need in order to proceed through approvals.

[redacted]. This could be discussed during our call on Wednesday.

Thanks,

Robert G. McCallum, P.Eng.
(613) 948-9450
robert.mccallum@canada.ca

Pages 137-139
are withheld
pursuant to paragraph
21(1)(b)
of the *Access to Information Act*

****

Les pages 137-139
Font l’objet d’une exception totale
conformément à la disposition du paragraphe
21(1)(b)
de la *loi sur l’accès à l’information*

ATIA - 16(2)
ATIA - 19(1)

Antinucci, Andrew (INFC)

From:	Barry Reimer [redacted]
Sent:	March 27, 2019 11:02 AM
To:	Djordjevic, Ana (INFC); Antinucci, Andrew (INFC); 'Casson, Linda'; 'Brown, Tim'; McCallum, Robert (INFC)
Subject:	RE: NU Fibre Project Discussion

Sorry, my connect just dropped and I am unable to connect back in ....

-----Original Appointment-----
From: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>
Sent: March 27, 2019 6:24 AM
To: Antinucci, Andrew (INFC); Casson, Linda; Brown, Tim; Barry Reimer; McCallum, Robert (INFC)
Subject: NU Fibre Project Discussion
When: March 27, 2019 10:30 AM-11:30 AM (UTC-05:00) Eastern Time (US & Canada).
Where: INFC CONF Ott-180Kent-09-001 CONF INFC

Discussion to follow-up on pressing issues regarding the Undersea Fibre Optic Cable Installation Linking Greenland, Nunavut and Quebec.

Call-in Information:

Local call-in number: 613-960-7510
Toll-free call-in number: 1-877-413-4781
Conference code [redacted]

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: March 27, 2019 1:18 PM
To: Djordjevic, Ana (INFC)
Cc: McCallum, Robert (INFC); Antinucci, Andrew (INFC)
Subject: FW: INFC Question-Response Table and Attachments for Submission
Attachments: NU Fibre Project - Question-Response Table - 2019-03-27.docx; 9_GN Fibre Project - Initial Questions INFC - 20181205.pdf; 1_[redacted].pdf; 2_[redacted]pdf; 3[redacted]pdf; [redacted].pdf; 5_ICPC-UNEP_Report.pdf; 6_[redacted]pdf; 7 _Fibre Optic Project - Households impacted - 20190108.pdf; [redacted]

Importance: High

Hi Ana
Here is the Response table with the information from Nunavut included.

We are looking forward to the questions but hope this info will answer many of the uncertainties at the moment.

Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: Barry Reime[redacted]
Sent: March 27, 2019 11:53 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
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Subject: INFC Question-Response Table and Attachments for Submission
Importance: High

Hi Linda,

ATIA - 19(1)

As just discussed following our call with INFC this morning, I am enclosing the updated question/response matrix as well as the most current version of all attachments to be included (including the ones you sent me this morning by renumbered). Note that I made a couple of minor changes to a couple of the attachments, so please be sure to use this set rather than the versions with the draft I sent out earlier in the week.

Unless you have any other questions, I approve these for your release to INFC.

Thanks!
Barry

Barry Reimer[redacted]
ᐱᐅᕆ ᕇᒧ
Project Director, Katittuq Nunavut
(Greenland-Nunavut Undersea Fibre Project)
M: [redacted]

Pages 143-163
are withheld
pursuant to paragraphs
13(1)(c), 14 & 21(1)(b)
of the *Access to Information Act*

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Les pages 143-163
Font l’objet d’une exception totale
conformément aux dispositions des
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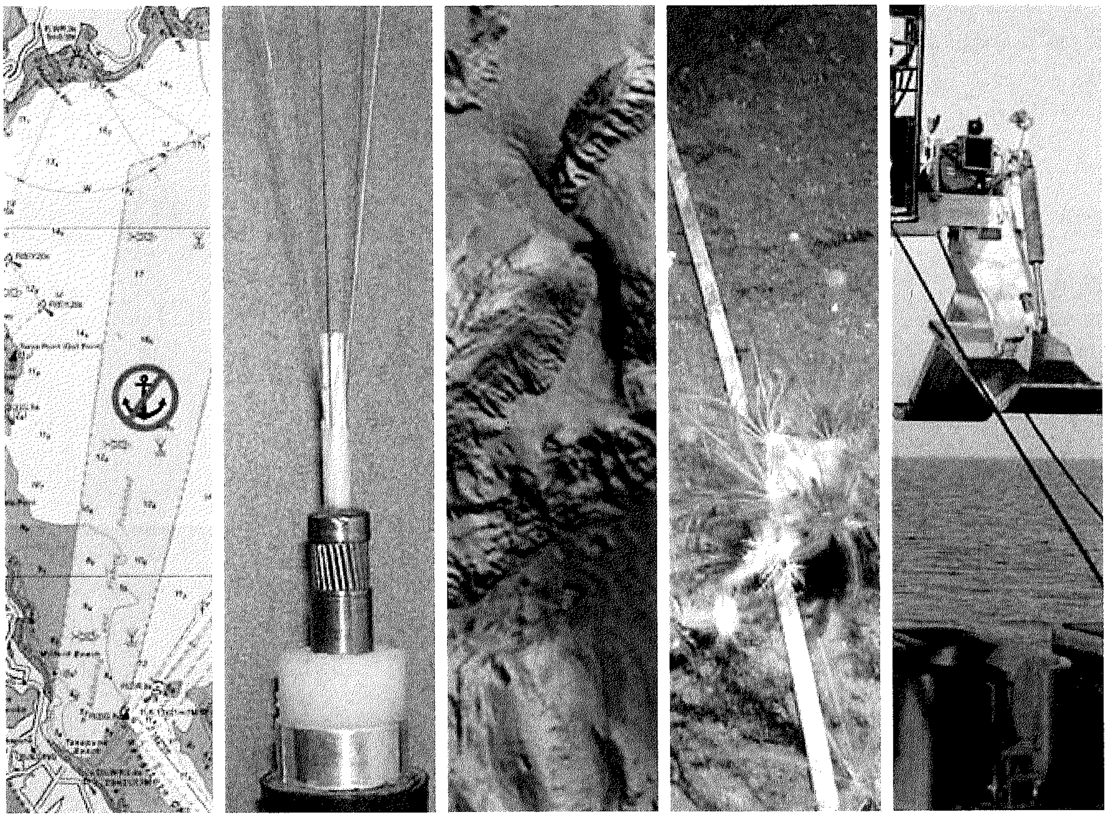
13(1)(c), 14 & 21(1)(b)
de la *loi sur l’accès à l’information*

Submarine cables and the oceans: connecting the world



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The United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) is the biodiversity assessment and biodiversity policy support arm of the United Nations Environment Programme (UNEP), the world's foremost intergovernmental environmental organization. The Centre has been in operation for over 25 years, combining scientific research with practical policy advice.

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The International Cable Protection Committee Ltd (ICPC) is a non-profit organization that facilitates the exchange of technical, legal and environmental information concerning submarine cable installation, maintenance and protection. It has over 100 members representing telecommunication and power companies, government agencies and scientific organizations from more than 50 countries, and encourages cooperation with other users of the seabed.

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Foreword

There are many things and services in our everyday life that we take for granted, and telecommunications is one of them. We surf the internet, send emails to friends and colleagues abroad, talk to family members in foreign countries over the phone, book airline seats and make banking transactions without actually realizing and appreciating the sophisticated technology that enables us to do so.

There is a common misconception that nowadays most international communications are routed via satellites, when in fact well over 95 per cent of this traffic is actually routed via submarine fibre-optic cables. Data and voice transfer via these cables is not only cheaper, but also much quicker than via satellite.

The first submarine cable – a copper-based telegraph cable – was laid across the Channel between the United Kingdom and France in 1850. Today, more than a million kilometres of state-of-the-art submarine fibre-optic cables span the oceans, connecting continents, islands and countries around the world. Arguably, the international submarine cable network provides one of the most important infrastructural foundations for the development of whole societies and nations within a truly global economy.

At the beginning of the submarine cable era, there was a widely held belief that the riches of the ocean were too vast ever to be affected by humans. Apart from shipping and regional fishing, there were few other uses of the sea and most of the marine environment (the little that was known) was still relatively pristine.

Today, the situation is vastly different. Human activities, directly or indirectly, have affected and altered all environments world-wide, including the 71 per cent of the planet that is ocean. The number and the intensity of maritime uses have increased dramatically and will continue to do so in the future, stretching the capacity of the oceans and their finite space and resources to the limit – or even beyond. In the light of the actual and potential pressures and impacts this creates on marine biodiversity and ecosystems (including the services and functions they provide for humankind and life on Earth), governments and international organizations have recognized that there is an urgent need for wise conservation and protection in concert with the sustainable management and use of the oceans and their resources. Even the placement and operation of submarine telecommunications cables, as one of the oldest and arguably one of the most important uses of the sea, has to be considered in this process. In order to focus and guide these deliberations and decision making, an objective, factual description of this industry and the interaction of submarine telecommunications cables with the marine environment is needed: information that the reader will find in this report.

We hope that this report will contribute to and strengthen the ongoing exchange of information, mutual education and cooperation between all stakeholders, so that, despite increasing technological change and environmental pressures, we can continue to share the seabed in harmony for the benefit of all.

Ibrahim Thiaw
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The authors are indebted to Stefan Hain for his encouragement, expertise and general advice. Without that contribution, this novel project would not have happened. The authors gratefully acknowledge the external reviewers, Robert Beckman, David Billet, Kristina Gjerde, Malcolm Gilberd, Alan Green, Michelle Dow, Don Hussong, Jihyun Lee, Claus Nielsen, Myron Nordquist, Alain Polloni, Neil Rondorf, John Tibbles, Dean Veverka, Bob Wargo, Robin Warner, Nigel Weaver and Ian Wright, whose expert commentaries and critiques improved the manuscript versions of this report. We are also indebted to those individuals, companies and institutions who generously contributed images, each of which is attributed to the contributor in the caption text. Those photographs and graphics are a fundamental part of the report. Finally, we acknowledge UNEP and ICPC for providing the opportunity for this collaborative venture. Although from different cultures, both organizations recognize the value of providing an evidence-based synopsis of the interactions between the marine environment and the submarine cable network. In that context, this report could be viewed as the first step towards a knowledge base to guide future management and use of the marine environment. The views presented in this report, together with any errors or inconsistencies, are the responsibility of the authors.

Contents

Acronyms and abbreviations

ACC	Antarctic Circumpolar Current
ACMA	Australian Communications and Media Authority
AT&T	American Telephone and Telegraph Company
ATOC	Acoustic Thermometry of Ocean Climate
CANTAT	Canadian Trans-Atlantic Telephone cable
CBD	Convention on Biological Diversity
CPZ	Cable protection zone
DTS	Desktop study
EEZ	Exclusive economic zone
EIA	Environmental impact assessment
ENSO	El Niño-Southern Oscillation
ESONET	European Seafloor Observatory Network
FAD	Fish aggregating devices
FAO	Food and Agriculture Organization of the United Nations
GCCS	Geneva Convention on the Continental Shelf
GCHS	Geneva Convention on the High Seas
GISS	Goddard Institute for Space Studies, NASA
GPS	Global positioning system
ICES	International Council for the Exploration of the Sea
ICPC	International Cable Protection Committee
IEEE	Institute of Electrical and Electronic Engineers, USA
IPCC	Intergovernmental Panel on Climate Change
ITLOS	International Tribunal for the Law of the Sea
MBARI	Monterey Bay Aquarium Research Institute, USA
NASA	National Aeronautics and Space Administration, USA
NEPTUNE	North-East Pacific Time-series Undersea Networked Experiments
NIWA	National Institute of Water and Atmospheric Research, New Zealand
NOAA	National Oceanic and Atmospheric Administration, USA
OFCC	Oregon Fishermen's Cable Committee
OOI	Ocean Observatories Initiative
OSPAR	Oslo and Paris Convention for the Protection of the Marine Environment of the North-East Atlantic
ROV	Remotely operated vehicle
SCIG	Submarine Cable Improvement Group
TAT-1	Trans-Atlantic Telephone, first trans-ocean telephone cable
UKCPC	United Kingdom Cable Protection Committee
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UV-B	Ultra-violet light, type B
WCMC	World Conservation Monitoring Centre (of UNEP)

Introduction

This report results from collaboration between the United Nations Environment Programme (UNEP) and the International Cable Protection Committee (ICPC), which represents the majority of ocean users within the submarine telecommunications cable industry. Why is such a report required? The last 20 years have seen exponential growth of and increasing reliance on the internet for communication, commerce, finance, entertainment and education. That remarkable development has been accompanied by rapid growth in international telephone communications. Whether sending an email, making an airline booking or simply telephoning overseas, there is more than a 95 per cent probability that those actions will involve the international submarine cable network. In recognition of its importance as the backbone of the internet, governments now view the submarine telecommunications cable network as *critical infrastructure* that deserves a high level of protection (e.g. ACMA, 2007).

The communications revolution has occurred against a backdrop of greater pressure on the ocean from increased human activities, which range from the exploitation of resources to anthropogenic global warming (e.g., UNEP-WCMC, 2009; IPCC, 2007). In response to concerns about potential and actual impacts on the marine environment, governments and international organizations have stepped up their efforts to ensure the conservation, protection and sustainable management/use of coastal seas and deep offshore waters. In the light of recent scientific discoveries (e.g. Masson *et al.*, 2002; Freiwald *et al.*, 2004), discussions about the risks to vulnerable and threatened marine ecosystems and biodiversity in areas beyond national jurisdiction have emerged. It was this increased international awareness and interest in the deep and high seas environments that led UNEP and the ICPC to collaborate in the preparation of this report in 2004, with the shared objective of providing a factual context for discussions involving submarine fibre-optic cables and the environment. As such, it allows for more informed decision making, especially when weighing the benefit of an activity against any potential negative environmental impact (e.g. UNEP, 2007). It should be noted that *Submarine Cables and the Oceans – Connecting the World* focuses exclusively on fibre-optic telecommunications cables, and hence does not address submarine power cables.

The opening chapters of this report are a compendium of information that starts with a history of submarine telecommunications cables. The first transoceanic cable came into full operation in 1866, when a link was established between Ireland and Newfoundland that allowed transmission of seven words per minute via telegraph. Today, a modern fibre-optic cable can transport vast amounts of data and is capable of handling literally millions of simultaneous telephone calls. Even so, deep-ocean fibre-optic cables are no larger than 17–21 mm diameter – about the size of a domestic garden hose. Closer to shore (in water depths shallower than about 1,500 m), a cable's diameter may increase to 40–50 mm due to the addition of protective wire armouring. Chapter 3 focuses on submarine cable operations and presents an insight into the technology that permits accurate placement of a cable on or into the seabed. Modern seabed mapping systems such as multibeam side-scan sonar and high-definition seismic profilers, used in conjunction with satellite navigation equipment, permit submarine cables to be installed with unprecedented precision. Thus, hazardous zones and ecologically sensitive locations, such as volcanic areas and cold-water coral communities, can be avoided. All cables eventually come ashore, and it is in these shallow coastal waters that they are at most risk from human activities, especially ships' anchoring and bottom trawl fishing, which are together responsible for most submarine cable faults. As a result, special protective measures are needed that typically include the addition of steel armour to the cable exterior and, where possible, burial into the seabed. Cable deployment within the waters of a coastal state generally requires some form of environmental impact assessment (EIA) covering the potential effects of the survey and laying operations on the local environment, other seabed users and underwater cultural heritage sites.

The success and very existence of international submarine cable systems owe much to the treaties that the nations of the world have introduced into customary international law since 1884. These international norms are widely accepted and followed by the cable industry as well as the global community. They are an excellent example of international law working at its best in balancing competing uses in the ocean. Chapter 4 provides a basic restatement of the current international legal regime that underpins the world's undersea communications network.

Open-file information from environmental agencies, together with published studies, forms the basis of Chapter 5, which examines the environmental impacts of modern submarine cables and associated operations. The main threats to cables are found in water depths shallower than about 1,500 m, the present limit of most bottom trawl fishing, although some boats are extending that limit to 2,000 m depth. In these continental shelf and slope areas, cables require some form of protection. This may be achieved through legislation for the creation of protection zones (e.g. ACMA, 2007), or by physical means such as burial beneath the seabed. In the case of designated and controlled protection zones, there may be no need to bury cables, in which case they are exposed to waves, currents and the marine biota. How a cable interacts with the environment depends on the many influences and factors that shape the ocean. However, the small physical size of a telecommunications cable implies that its environmental footprint is likely to be small and local; a suggestion that is borne out by several studies, e.g. Kogan *et al.* (2006). Using a combination of sediment samples and direct observations made with a remotely operated vehicle (ROV), Kogan *et al.* concluded that a telecommunications cable off Monterey Bay, California, had minimal to no impact on the fauna living in or on the surrounding seabed, with the exception that the cable locally provided a firm substrate for some organisms that otherwise would not have grown on the mainly soft seafloor sediments. These results contrast with the findings of an earlier study by Heezen (1957), who documented a significant impact on marine life, namely the entanglement of whales with old telegraph cables. However, such distressing occurrences were restricted to the telegraph era (1850s to c.1950s). With improved design, laying and maintenance techniques, which developed with the first coaxial submarine cables in the 1950s and continued into the fibre-optic era beginning in the 1980s, no further entanglements with marine mammals have been recorded (Wood and Carter, 2008). The remainder of Chapter 5 considers the environmental effects of cable burial and recovery as well as broader issues concerning the relationship between cables and ecologically sensitive areas, and the potential use of cable protection zones as *de facto* marine sanctuaries.

The December 2006 earthquake off southern Taiwan focused the world's attention not only on the human tragedy, but also on the impact of natural hazards on the submarine cable network. The magnitude 7.0 earthquake triggered submarine landslides and dense sediment-laden flows (turbidity currents), which passed rapidly down to the +4,000 m-deep ocean floor, breaking nine fibre-optic submarine cables en route (Figure 1). Southeast Asia's regional and global telecommunications links were severely disrupted, affecting telephone calls, the internet and data traffic related to commerce and the financial markets. As outlined in Chapter 6, such natural hazards generate less than 10 per cent of all cable faults, but fault occurrence rises to around 30 per cent for cables in water deeper

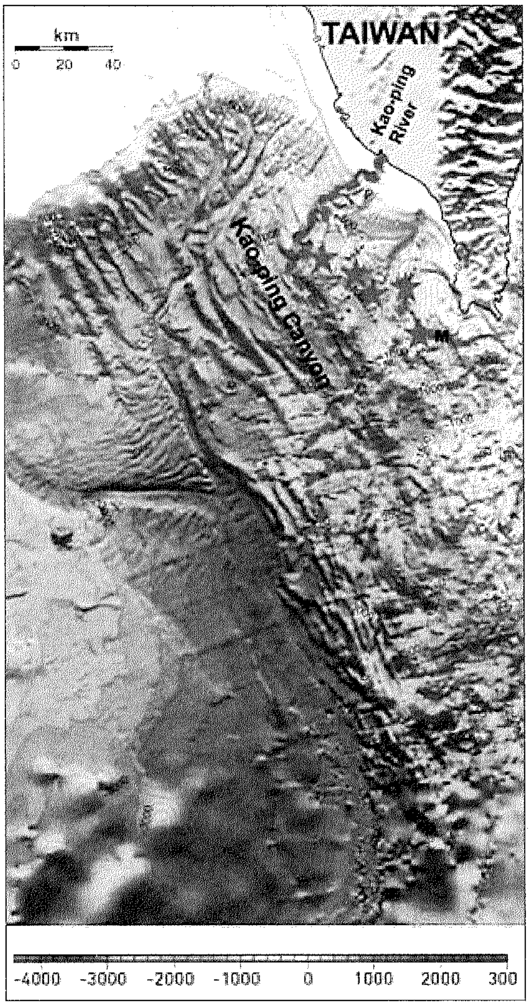


Figure 1: On 26 December 2006, a magnitude 7.0 earthquake and after shocks (pink stars) set off several submarine landslides off southern Taiwan. These slides transformed into fast-flowing mud-laden currents that sped down Kao-ping submarine canyon (red dashes) into a deep-ocean trench: a distance of over 300 km. Nine cables were broken en route, disrupting international communications for up to seven weeks. *Source: Professor C.S. Liu, Institute of Oceanography, National Taiwan University.*

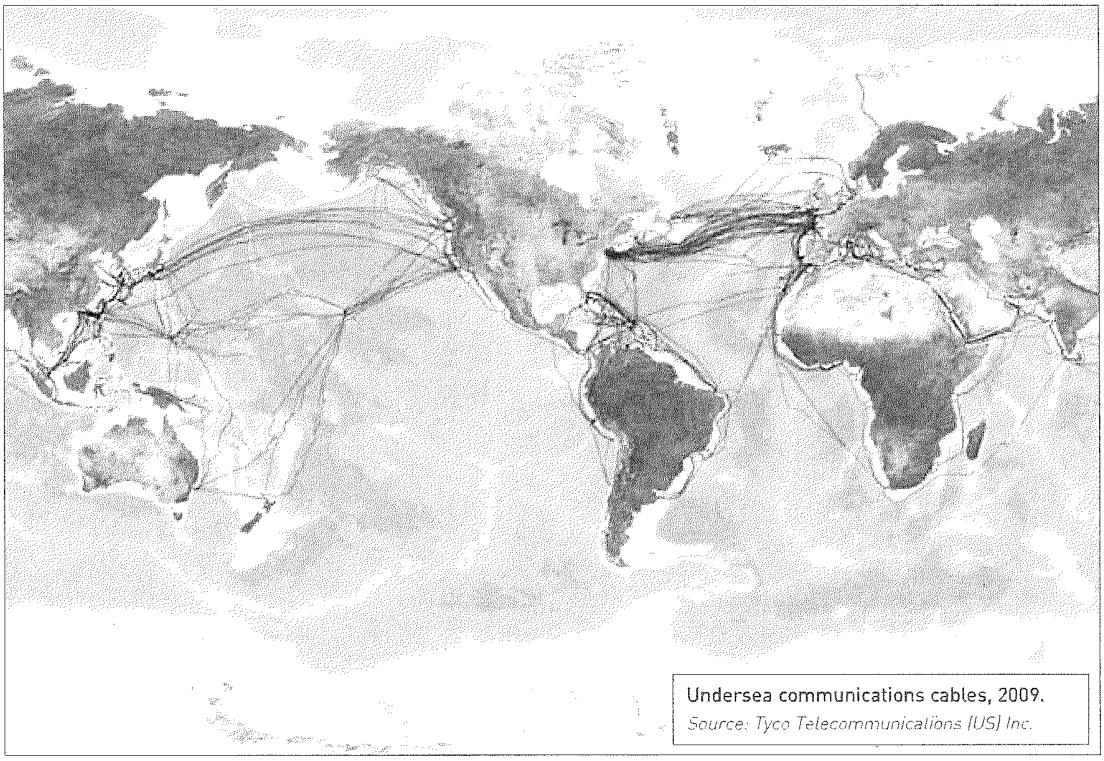
than c.1,500 m, i.e. beyond the main zone of human offshore activities. And, as seen off Taiwan in 2006 and Newfoundland in 1929, the consequences of major hazards can be profound. Seismically triggered submarine landslides and turbidity currents, along with major storms, wave and current action, and even river floods, pose the largest natural threat to cables, with volcanic eruptions and iceberg scour playing very minor roles. Furthermore, cables are unlikely to be exempt from the anticipated changes in the ocean resulting from human-influenced climate change. High on the list of potential hazards are rising sea level and more powerful storms, which together are likely to threaten the shallow and coastal reaches of cable routes. Regional changes in wind patterns, precipitation and ocean currents are also likely to have an effect.

Integrating cable activities with other seabed uses is the theme of Chapter 7. Mid-water to bottom trawl fishing, dredging, ships' anchoring and some recreational activities threaten underwater communications. Because it is the most significant cause of cable faults, Chapter 7 concentrates on fishing, presenting an overview of fishing gear and practices, risks to cables, fishing vessels and crew, and means of reducing those risks. Risk reduction is achieved through close consultation between cable engineers and fishermen so that there is a full understanding of their respective equipment and operations, e.g. knowledge of the type of trawl gear deployed allows engineers to identify a suitable burial depth for a cable. Other mitigation measures may involve cable routing, armouring, clear identification of cable routes on marine charts, educational material and stakeholder working groups consisting of fishing and cable representatives.

The report ends with a discussion of future activities in the ocean based on present trends in offshore conservation, renewable energy development and resource exploitation. There is no doubt that the oceans, and especially the coastal seas, are under increasing pressure from a growing range of human activities. The past decade has witnessed an expansion of offshore renewable energy schemes (in particular wind turbine farms) as nations seek to lower emissions of greenhouse gases and establish secure supplies of energy. Fishing activities are changing due to reduced stocks in coastal seas. Trawling is now moving into deeper waters, although this may be tempered by the increased costs of operating further offshore, lower biomass in more distant, deeper waters and rapid stock depletion because of fish life-history characteristics (e.g. Clark *et al.*, 2000; Pauly *et al.*, 2003). As China, India and other nations develop their industrial sectors, the import of raw materials and export of manufactured goods have expanded. Shipping routes, traffic volumes and vessel size have all undergone major adjustments brought about by profound shifts in the global economy. Offshore exploration and production of hydrocarbons are also set to extend into deeper water, with operations taking place at depths of 3,000 m and beyond. Deep-sea mining for minerals has recently attracted increased interest, with commercial operations planned for the near future. Furthermore, the science community is establishing long-term ocean observatories (e.g. Ocean Sites, 2009) to determine how the deep ocean and seabed function, to discover what biodiversity and ecosystems they harbour, and to detect natural hazards and responses to climate change.

As a consequence of these pressures, nations and international groups are seeking to preserve ocean ecosystems through the formation of marine protected areas and similar devices (e.g. OSPAR Commission, 2009). In the face of increasing human activities in the marine environment, it has become vital for relevant parties and stakeholders to communicate and cooperate. In this manner, harmonious development and conservation of the 71 per cent of Earth's surface found beneath the oceans can be realized. This is far from an idle sentiment: it is founded on the extensive experience of the collaborators of *Submarine Cables and the Oceans – Connecting the World*, actively working with other seabed users.

1. A history of submarine cables



Undersea communications cables, 2009.
Source: Tyco Telecommunications (US) Inc.

TELEGRAPH ERA

Submarine cables were born around the 1820s. Baron Schilling von Canstatt, an attaché with the Russian Embassy in Munich, successfully exploded gunpowder mines using insulated wires laid across the River Neva, near St Petersburg (Ash *et al.*, 2000). His interest moved to the electric telegraph, which he integrated with another earlier device known as Schweigger's 'Multiplier', in order to improve the sensitivity of a compass needle. Once combined, 'Schilling's Telegraph' was able to communicate messages through a directed needle that moved across black and white paper disks representing letters of the alphabet and numbers (Stumpers, 1884; Ash *et al.*, 2000).

Inventions involving telegraphy escalated through the 19th century. In 1836, English chemist and inventor, Edward Davey, came close to completing a practical telegraph system. He envisioned an electric telegraph that could be insulated for protection and placed underwater with relay-type 'repeaters' to boost weak signals along the cable. This was the forerunner of the submarine telegraph cable. Close to success, Davey unexpectedly departed for Australia, leaving his main competitors, William Cooke and Charles Wheatstone, to complete an operational telegraph (Stumpers, 1884; Ash *et al.*, 2000). Their system was patented in 1837 and involved the identification of alphabetic letters by deflections of magnetic needles. At about the same time, Samuel Morse patented a telegraph based on an electromagnetic system that marked lines on a paper strip. The technique came into commercial reality in 1844 when a communications link was made between Baltimore and Washington, DC.

The concept of insulating submarine telegraph cables to make them durable, waterproof and sufficiently strong to withstand waves and currents, fostered several trials with different materials. In 1843, Samuel Morse produced a prototype by coating a hemp-covered cable in tar and pitch;

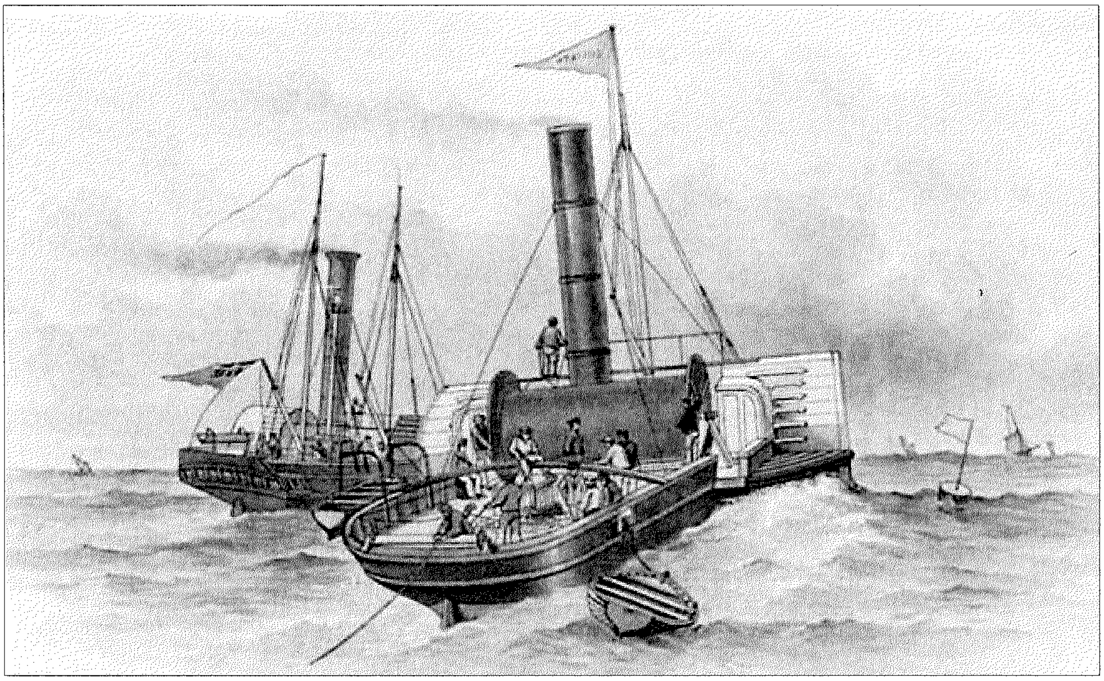
Figure 1.1: Tapping gutta percha, a natural polymer used for insulating early submarine cables. *Source: Bright (1898); courtesy of archives of BT Heritage.*

Figure 1.2: The steam tug, *Goliath*, laying the first international submarine cable between Dover and Calais, 28 August 1850. The vessel was accompanied by HMS *Widgeon. Source: Bright (1898).*

insulation provided by a layer of rubber also gave the cable strength and durability (Ash *et al.*, 2000). By the late 1840s, the basic technology existed to manufacture submarine cables, and in 1848 the Gutta Percha Company received its first order for wire insulated with a newly discovered natural polymer from Malaya – gutta percha (Figure 1.1) (Kimberlin, 1994; Gordon, 2002; ICPC, 2007).

An English merchant family, headed by the brothers James and John Brett, financed a submarine cable across the English Channel from Dover to Calais. Constructed from copper wire and gutta percha without any form of protection, the cable was laid by the tug *Goliath* on 28 August 1850 (Figure 1.2) (Kimberlin, 1994; Ash *et al.*, 2000; Gordon, 2002). The cable lasted for just a few messages before it succumbed to vigorous waves and currents. A year later it was replaced by a more robust design comprising four copper conductors, each double coated with gutta percha, bound with hemp and heavily armoured with iron wires. This improved version extended the cables' working life to a decade. After installation, John Brett sent a special message to soon-to-be Emperor of France, Napoleon III – an act that symbolically marked the day that submarine telecommunications became an industry. By 1852, cables also connected England to the Netherlands and Germany, with other links between Denmark and Sweden, Italy and Corsica, and Sardinia and Africa.

Submarine cables of that time were far from perfect.



The copper used for the conductors tended to be hard, brittle and poorly conductive, while the gutta percha insulation was sometimes lumpy and only moderately flexible. There was a need to improve cable design and materials as the emerging communications industry looked to the Atlantic Ocean as the next great challenge (Figure 1.3). Such a communications link would allow British and American businesses to develop trade – particularly the British cotton industry.

In 1854, Cyrus Field, a wealthy American paper merchant, became interested in laying a telegraph cable across the Atlantic Ocean (Gordon, 2002). Along with John Brett and Sir Charles Bright, he founded the Atlantic Telegraph Company in 1856 (Ash *et al.*, 2000). Its board members included William Thomson, the eminent physicist who later became Lord Kelvin. After an unsuccessful attempt in 1857, the company laid the first trans-Atlantic cable in 1858, when Ireland was linked to Newfoundland (Figure 1.4). However, success was short lived, and after 26 days of operation the cable failed. Following three other attempts, a new and improved cable was laid in 1866 from the *Great Eastern* cable ship by the Telegraph Construction & Maintenance Company (TELCON) – a merger of the Gutta Percha Company and Glass, Elliot & Company (Figure 1.5). The new and more durable cable provided reasonably reliable communication at around 12 words per minute across the Atlantic. On its return journey to England, the *Great Eastern* recovered the cable lost the year before. A repair was made and connection with Newfoundland completed to provide a second trans-Atlantic cable link (Ash *et al.*, 2000; Gordon, 2002).

As telegraph technology and laying techniques improved, the submarine network expanded greatly. To facilitate government and trade, cables linked the United Kingdom with the many outposts of its empire. By the early 20th century, much of the world was connected by a network that enabled rapid communication and dissemination of information for government, commerce and the public.

The durability and performance of telegraph cables improved with new conducting, strengthening and insulating materials. Alloy tapes and wires, such as the iron-nickel, permalloy, and the copper-iron-nickel, mu-metal, were used to increase cable performance (particularly the speed of signalling) in the 1920s. Staff employed to send and receive telegraphic messages at relay stations were gradually replaced by electro-mechanical signallers. Transmission speeds increased progressively, and by the late 1920s speeds exceeding 200 words per minute became the norm.

By the 1930s there were just two cable manufacturers in Britain, TELCON and Siemens Brothers. The Great Depression and competition from radio-based communications made business difficult.. As a result, TELCON merged with the submarine communications cable section of Siemens Brothers to form Submarine Cables Limited. Despite the technological advances of the telegraph, the developing radio industry could do something that the telegraph could not – namely produce intercontinental voice communications. Marconi's company, Imperial, owned the patent to radio communication; it joined forces with the cable industry after they were encouraged to merge by the UK government. And so, in 1934, Cable & Wireless was born. The new partnership enabled even more rapid communications, which came into their own during the Second World War. Radio was used for communicating with troops,

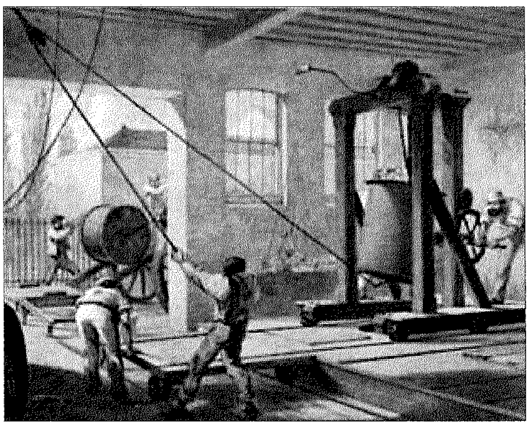
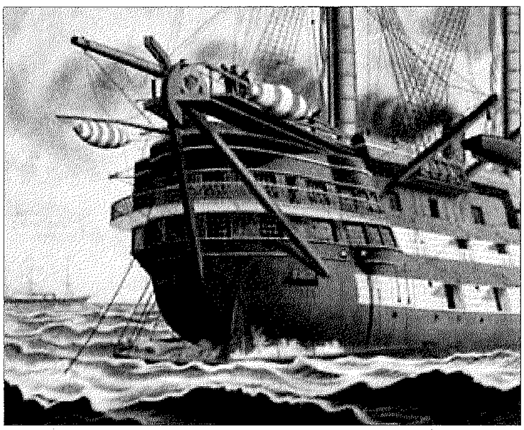


Figure 1.3: Loading gutta percha insulated cable for the *Great Eastern* cable ship. *Source: courtesy of archives of BT Heritage.*

Figure 1.4: HMS *Agamemnon* laying the first Atlantic cable in 1858. *Source: ARC photographs from archives of BT Heritage.*



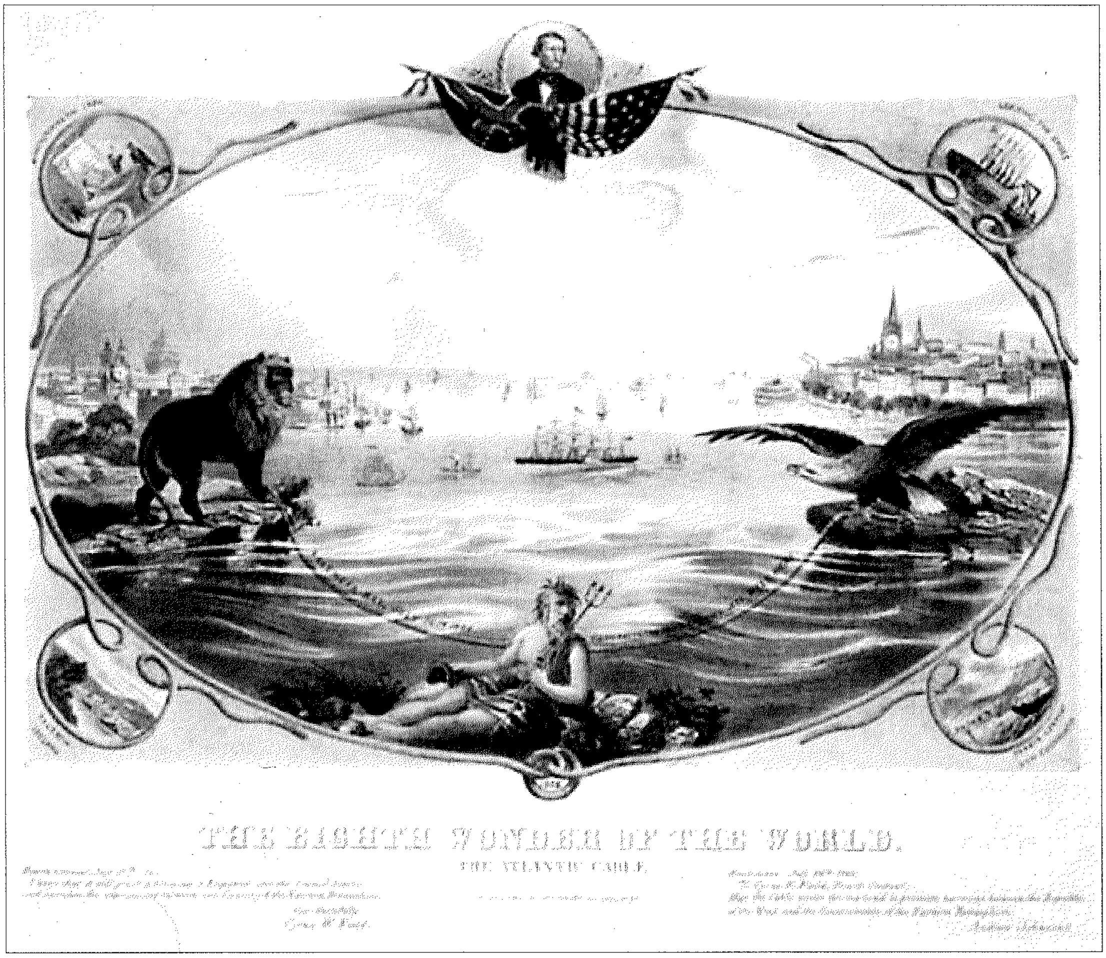


Figure 1.5: The first trans-Atlantic cables were promoted as the Eighth Wonder of the World by Cyrus Field and his colleagues, who emphasized cooperation between the United Kingdom and the United States. *Source: Kimmel and Foster (1866). Lithograph, Library of Congress.*

and submarine cables provided secure networks that could not be intercepted easily.

TELEPHONIC ERA

Following Alexander Graham Bell's invention of the telephone in 1875, it was only a matter of time before phone lines linked continents by submarine cables. Initial attempts in the United States and United Kingdom met with limited success. The British Post Office laid a telephone cable across the English Channel, but inherent deficiencies of the gutta percha insulation meant that signals were limited to short distances before they became distorted. The discovery of polyethylene in 1933 made trans-oceanic telephony possible. In 1938, a polyethylene-encased cable was developed with a copper coaxial core capable of carrying a number of voice channels (Chapter 2). That innovation, along with the use of repeaters to boost the signals, meant that a trans-oceanic cable with multiple voice channels was achievable. Thus in 1955–1956, two cables were laid between Scotland and Newfoundland as a joint venture between the British Post Office, American Telephone and Telegraph (AT&T) and the Canadian Overseas Telecommunications Corporation. The system, named TAT-1, came into service on 25 September 1956, and in the first day of operation carried 707 calls between London and North America. The era of submarine coaxial telephone communications had begun. With it came a suite of technological developments relating to the design of signal-boosting repeaters, new methods of

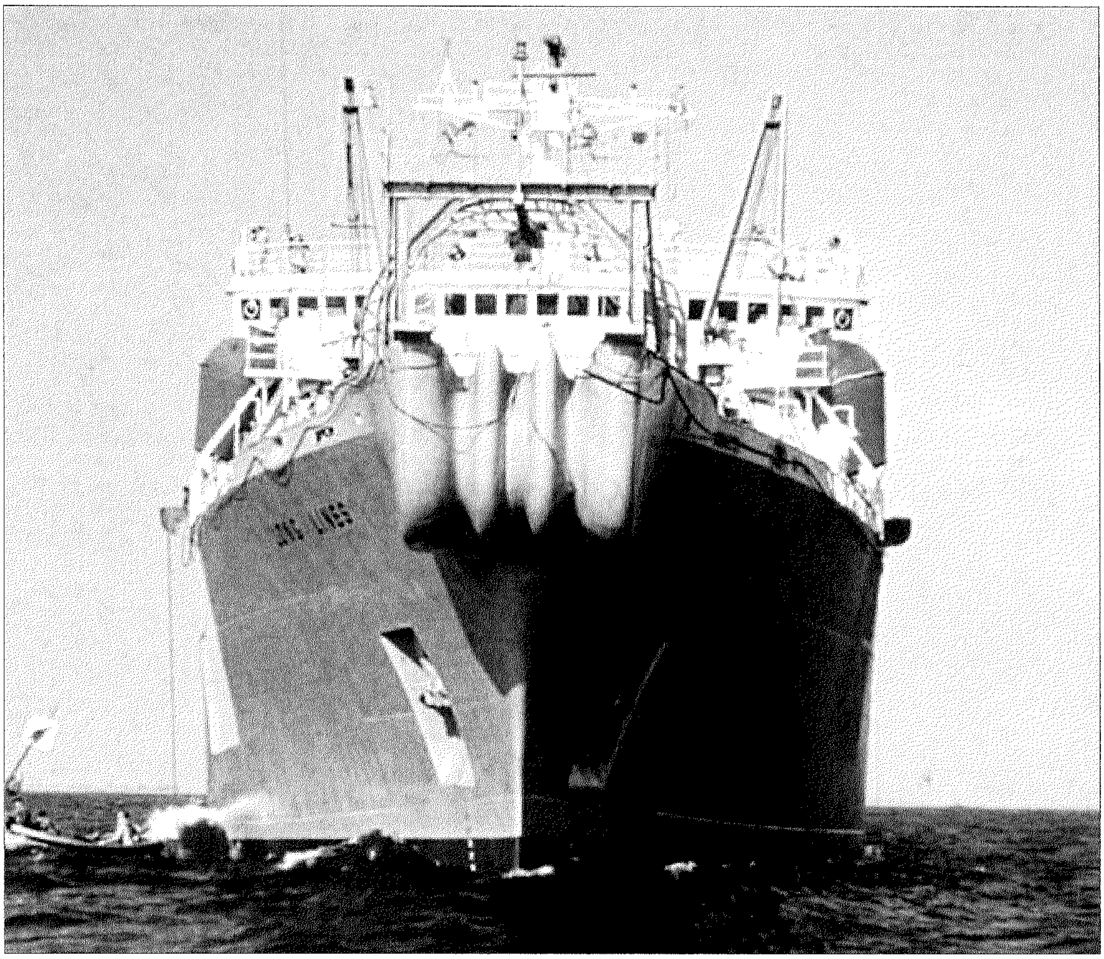


Figure 1.6: CS *Long Lines* which, together with cable ships from France and the United Kingdom, laid the first trans-Atlantic fibre-optic cable (TAT-8). *Source: AT&T Inc.*

cable laying and improved methods of strengthening cables, especially in deep water where as much as 6 km of cable could be suspended through the water as it was laid on the ocean floor from a cable ship.

In the 1970s and early 1980s, these relatively low-bandwidth cables were only cost-effective on high-density communication routes, with the bulk of global trans-oceanic traffic carried by satellites. The last coaxial system across the Atlantic Ocean was TAT-7, which had a capacity of 4,000 telephone channels. However, to achieve this repeaters had to be installed at 9 km intervals, which made the technology very expensive. A more cost-effective solution was needed to meet the increasing demand for more capacity at reasonable cost. The race to develop fibre-optic technology for application in submarine cables began in the mid-1970s, thus heralding the dawn of another technological revolution in submarine communications.

FIBRE-OPTIC ERA

Glass fibres could carry 12,000 channels, compared to 5,500 for the most advanced coaxial cable. Furthermore, the quality of fibre-optic communication was superior. However, at this stage it was difficult to envisage that fibre-optic cables would form a global network. Over the next decade, scientists continued to improve and refine fibre-optic technology. The world's first trial of a submarine fibre-optic cable was in Loch Fyne in 1979 (Ash *et al.*, 2000). The trials proved that the cable could withstand the mechanical stresses involved in laying, as well as retaining the required stability of transmission characteristics. By 1986, the first international system was installed across the

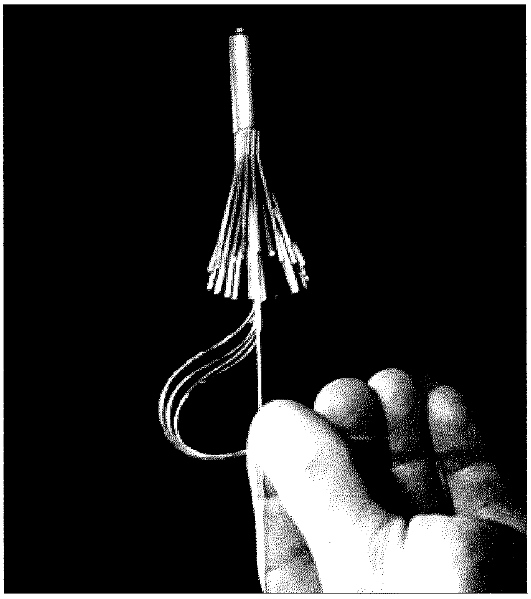


Figure 1.7: A section of TAT-8, the first trans-oceanic fibre-optic cable which, together with a developing internet, heralded a new age of communications. *Source: AT&T Inc.*

English Channel to link the United Kingdom and Belgium. In 1988, the first trans-oceanic fibre-optic cable was installed, which marked the transition when submarine cables started to outperform satellites in terms of the volume, speed and economics of data and voice communications. TAT-8 linked the United States, United Kingdom and France and allowed for a large increase in capacity (Figures 1.6 and 1.7). At about that time, the internet began to take shape. As newer and higher-capacity cable systems evolved, they had large bandwidth at sufficiently low cost to provide the necessary economic base to allow the internet to grow. In essence, the two technologies complemented each other perfectly: cables carried large volumes of voice and data traffic with speed and security; the internet made that data and information accessible and usable for a multitude of purposes. As a result, communications, business, commerce, education and entertainment underwent radical change.

Despite the success of submarine telecommunications, satellite transmission remains a necessary adjunct. Satellites provide global broadcasts and communications for sparsely populated regions not served by cables. They also form a strategic back-up for disaster-prone regions. By comparison, submarine cables securely and consistently deliver very high-capacity communications between population centres. Such links are also cost-effective, and the advantages of low cost and high bandwidth are becoming attractive to governments with low population densities. The amount of modern submarine fibre-optic cables laid in the world's oceans has exceeded a million kilometres and underpins the international internet. Almost all trans-oceanic telecommunications are now routed via the submarine cable network instead of satellite.

2. Inside submarine cables

DESIGNED FOR THE DEEP

A submarine cable is designed to protect its information-carrying parts from water, pressure, waves, currents and other natural forces that affect the seabed and overlying waters. Most of these forces change with depth. Temperatures become colder, pressure increases and wave effects lessen, but strong current action can occur at any depth. There are also the impacts of human activities, most notably fishing and shipping.

Designing cables to meet such challenges has been a quest for more than 160 years. In 1842, for instance, a telegraph cable laid across the East River, New York, by Samuel Morse, was soon damaged by a ship's anchor. Designing cables to cope with such mishaps progressed rapidly. Redesigning the first cables across the English Channel in 1851 and the first trans-Atlantic link in 1858 allowed these pioneering systems, which had failed on their first deployments, to operate successfully (Chapter 1). Nevertheless, the fundamental design of telegraph cables changed little for the next 100 years (Figure 2.1; Haigh, 1968).

Telegraphy involved the transmission of coded electrical impulses through a conductor, which in a submarine cable was a stranded copper wire with gutta percha insulation wrapped in brass or jute tape (Figure 2.1). This construction, however, had insufficient strength to withstand deployment or recovery from any appreciable water depth. As a result, a sheathing of wires or *armour* was added to provide strength. Armour also protected the cable, and various wire types and layers were devised to meet different seabed conditions. Two-layered or double armour helped protect against anchors and fishing gear, as well as abrasion under wave and current action in coastal seas. Heavy single-armoured cable was designed

Figure 2.1: Submarine telegraph cables from the early 1900s, with the inner copper conductor for transmitting messages, an insulating layer of the tree resin, gutta percha, and one or more outer layers of iron wire for strengthening and protecting the whole assembly. *Source: Lonnie Hagadorn.*

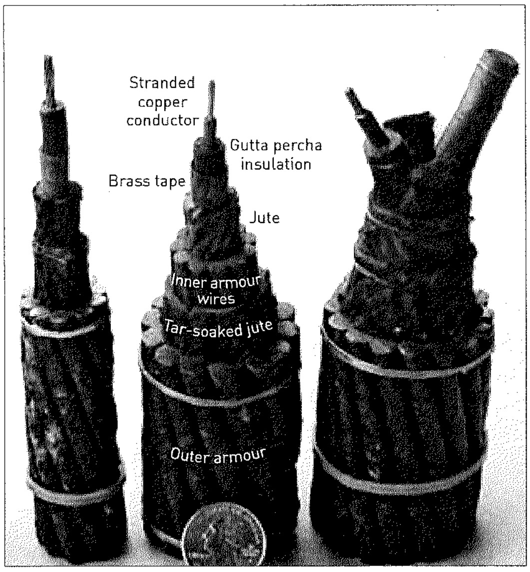
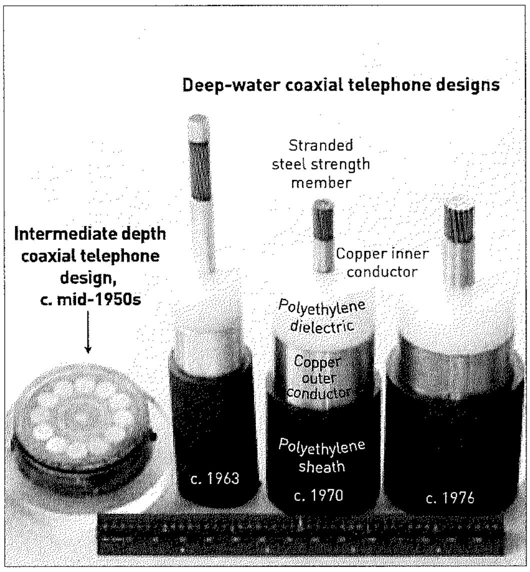


Figure 2.2: Cables of the coaxial telephonic era, with a core of steel wires for strength, an inner copper sheath, which also acted as the conductor, encased in polyethylene dielectric, and an outer conductor. The assembly was coated with black polyethylene which, in shallow water, was armoured for protection. *Source: Lonnie Hagadorn.*



for intermediate water depths beyond the reach of anchors and most trawl fishing gear. Light single armour was a deep-water design that allowed cables to be laid in full ocean depths (Haigh, 1968).

ANALOGUE CABLES ARRIVE

Coaxial or analogue cables came into use in the 1950s and continued for the next 40 years and more. They differed from telegraph cables in three key ways:

1. Instead of gutta percha, polyethylene was used exclusively as the insulator or dielectric. It also formed the outer sheath of deep-ocean designs (Figure 2.2).
2. The cable core had a coaxial structure consisting of an inner and outer conductor of copper separated by polyethylene insulation material.
3. The first trans-Atlantic analogue cable (TAT-1) used traditional armour for strength. However, later cables used fine-stranded, high tensile strength steel wires encased in the central conductor. As a result, deep-ocean systems did not require armour, although cables in shallow seas still needed a strong outer casing for protection (Figure 2.2).

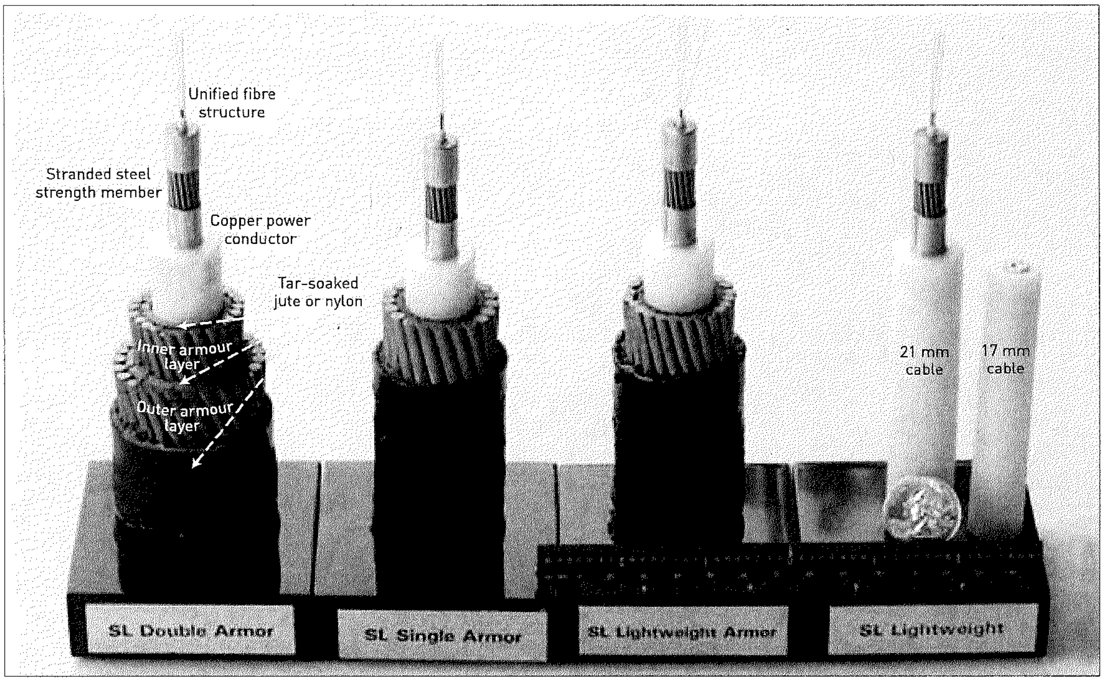
TAT-1 had about 36 individual voice channels, and used two cables, one for each direction of transmission. In addition, electrically powered amplifiers or repeaters were needed to boost the transmission, and these were inserted into the cable at spacings of c.68 km in deep water (Bell, 1957).

Analogue cable and repeater technology improved rapidly through the 1960s and 1970s, allowing a cable to carry up to 5,000 telephone calls. However, this increase in bandwidth was accompanied by an increase in cable size and repeater numbers, whose spacing was reduced to 6–9 km in the highest capacity systems. This made it extremely expensive to install trans-oceanic communication systems (Bell, 1957, 1964, 1970, 1978).

THE DIGITAL LIGHT-WAVE REVOLUTION

During the late 1970s and early 1980s, development focused on fibre-optic submarine cables that relied on a special property of pure glass fibres, namely to transmit light by internal reflection. By coding information as light pulses, data could be sent rapidly around the world. In 1985, the first deep-water repeatered design was laid off the Canary Islands. By 1988, the first trans-Atlantic fibre-optic cable (TAT-8) had been installed, followed several months later by

Figure 2.3: Shallow- to deep-water (left to right) fibre-optic cables, with a core supporting pairs of hair-like optical fibres surrounded by a layer of wire to provide strength, a copper conductor to power the repeaters or amplifiers that process the light signal, and a case of polyethylene dielectric. Wire armour is added for protection. *Source: Lonnie Hagadorn.*



the first trans-Pacific system. Such cables usually had two or more pairs of glass fibres. Originally, a pair could transmit three to four times more than the most modern analogue system. Today, a cable with multiple fibre-optic pairs has the capacity for over 1 million telephone calls. Despite this greatly enhanced capacity, modern cables are actually much smaller than analogue predecessors. Deep-ocean types are about the size of a garden hose (17–20 mm diameter), and shallow-water armoured varieties can reach up to 50 mm diameter (Figures 2.3 and 2.4). This means that instead of making four or five ship voyages to load and lay an analogue cable across the Atlantic, only one or two voyages are now required for fibre-optic types. It also means that the footprint of the cable on the seabed is reduced (AT&T, 1995).

Modern repeaters

With the digital light-wave revolution came major changes in the design of repeaters (Figure 2.5). Light signals still required amplification, and initially electronic regenerators were placed along a cable to boost signals. New systems, however, rely on optical amplifiers – glass strands containing the element erbium. Strands are spliced at intervals along a cable and then energized by lasers that cause the erbium-doped fibres to 'lase' and amplify optical signals. The typical spacing for this type of repeater is 70 km.

Fibre design changes

Since the advent of fibre-optic systems, major advances have been made in the manufacturing technology of the actual fibres. Various impurities or *dopants* are now added or removed from the glass to change its light-transmitting properties. The result is that the speed at which light passes along a glass fibre can be adjusted and controlled. This allows customized cables to be built to meet the specific traffic and engineering requirements of a route. This specialist use has increased the need for specialized repair services. The correct spare cable and fibre type must be used, which means that a comprehensive stock has to be carried by the cable repair authority. Repairs typically require removal of the damaged section followed by the splicing or jointing of the replacement section. During the telegraph and analogue eras, a single repair joint was a relatively quick (3–6 hours) and simple operation. It has now become a lengthy (10–24 hour), very specialized task that requires expensive and sensitive equipment. Hair-thin optical fibres must be aligned and spliced perfectly, followed by full testing before making the mechanical joint to give the repair strength and protection (AT&T, 1995).

CONCLUSIONS

The progress made in submarine cable design over the last 50-plus years has been remarkable. The world has

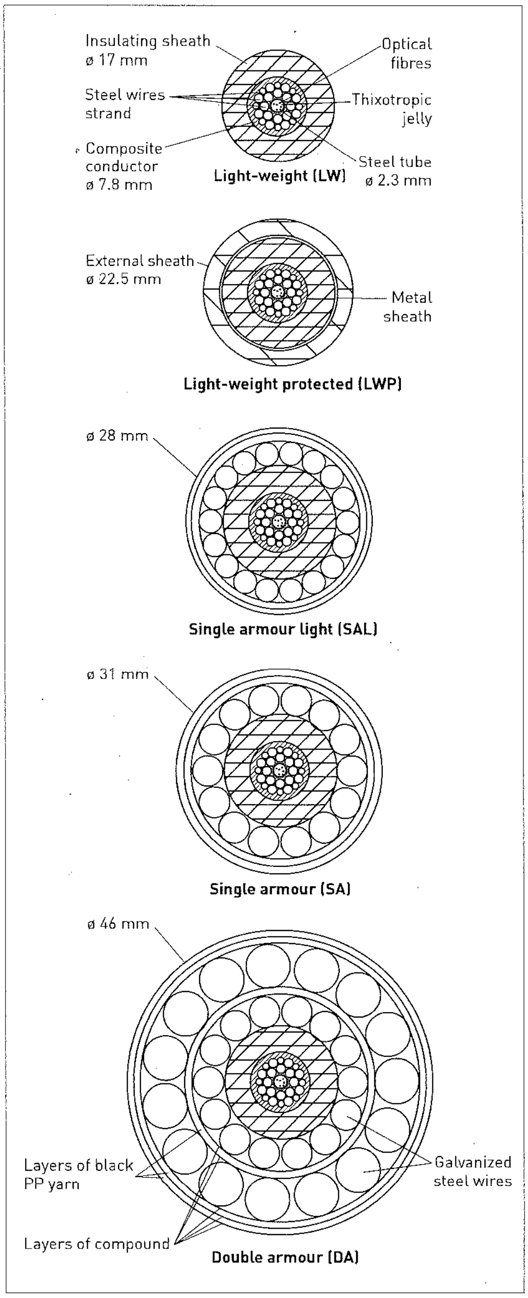


Figure 2.4: Modern fibre-optic cables (life-size), ranging from the typically used deep-ocean types (top two) leading to the shallow-water armoured varieties, which in many instances are now laid and buried into the seabed for additional protection. *Source: Lonnie Hagadorn.*

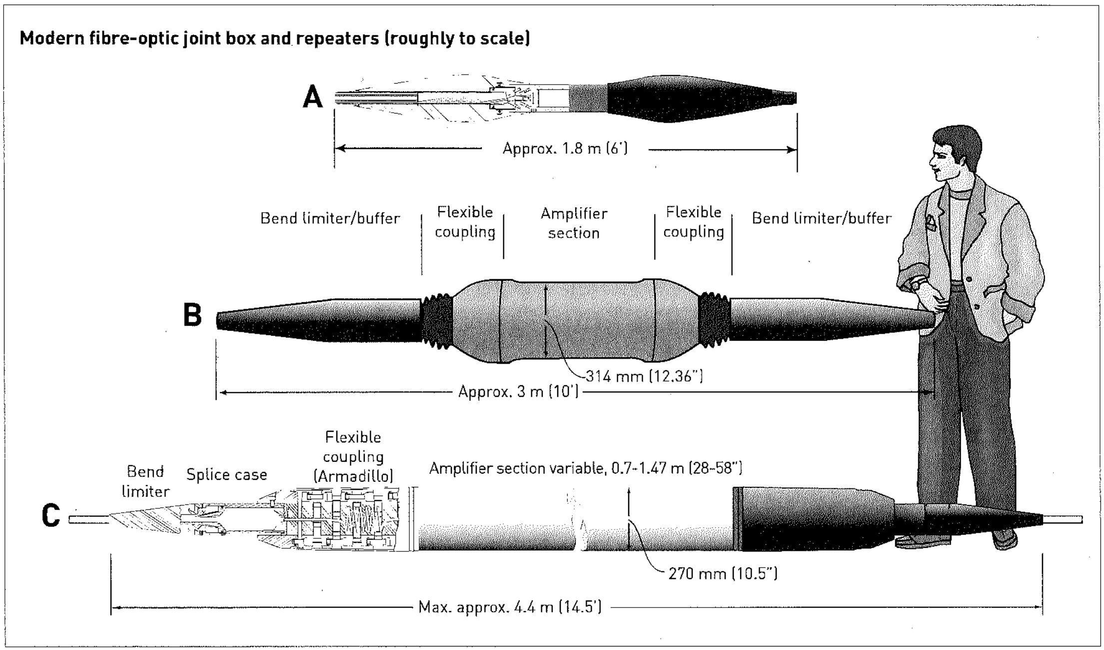


Figure 2.5: Representative repeaters from different manufacturers. The housings can accommodate as many as eight individual regenerators, or more recently, optical amplifiers. *Source: Lonnie Hagadorn.*

gone from single-circuit telegraph cables to fibre-optic systems with almost unlimited voice and data carrying capacities. The physical size of the cable itself has shrunk dramatically, and the reliability of the submarine components is down to just a few failures over the entire life of a long-distance system, which is typically 15–20 years. One can only wonder what progress the next 50 years will bring!

3. Survey, lay and maintain cables

ROUTE SELECTION

A key part of route selection is the identification and understanding of marine geopolitical boundaries that a proposed route may encounter. Access to databases such as Global Maritime Boundaries (NASA, 2009) can prevent unnecessary passage through areas where geopolitical constraints could affect the application or permit to place and maintain a cable on the seabed.

Definition of these maritime boundaries is provided by the United Nations Convention on the Law of the Sea (UNCLOS) (Chapter 4). The extent to which any coastal state controls cable-related activities within its territorial seas and exclusive economic zone varies, and depends on the nature and geographical jurisdiction of federal, state and/or local regulations that enact the provisions of UNCLOS in domestic legislation. For countries that have not ratified UNCLOS, the focus is on existing domestic legislation.

ROUTE SURVEY

Following the identification of potential cable landings that are to be connected, it is most effective to conduct a full review of pertinent available information in order to define the most efficient and secure route that will then be fully surveyed. This preliminary engineering, commonly referred to as a desktop study (DTS), is generally conducted by marine geologists with cable engineering experience who assemble all available hydrographic and geologic information about the pertinent region, commission fisheries and permitting reports if appropriate, consider the location and history of existing nearby cables and other obstructions, and then design an optimal route to be surveyed. The DTS will also generally include visits to the landings to determine where the cable crosses the beach and links to the cable terminal. Visiting landing sites also provides an opportunity to consult with local officials about possible cable hazards, environmentally sensitive areas, requirements to gain a permit to operate, fisheries, development plans and land access, amongst other factors. A comprehensive DTS will provide an optimal route design that can then be surveyed in the most cost-effective manner.

Based on the DTS, an efficient survey can then be designed along an optimized route to fully characterize that route and to avoid hazards and/or environmentally significant zones that may not have been identified from existing information. Surveys include water depth and seabed topography, sediment type and thickness, marine faunal/floral communities, and potential natural or human-made hazards. Where appropriate, measurements of currents, tides and waves may be needed to evaluate the stability of the seabed, movement of sediment and ocean conditions that may affect cable-laying and maintenance operations.

A route survey commonly covers a swath of seabed c.1 km wide in water depths down to about 1,500 m, reflecting the need to bury cables for protection according to local conditions. The width of the survey corridor can be adjusted largely in consideration of the expected complexity of the seabed, and the depth to which these complete surveys are conducted will be based on local hazards, particularly bottom trawl fishing and shipping activities, which may require the cable to be buried. Water depth is traditionally measured by echo-sounding, which has now developed into seabed mapping or *multibeam* systems. Whereas conventional echo-sounders measure a single profile of water depth directly under the ship, multibeam systems provide full depth coverage of a swath of seabed with a width that is three to five times the water depth (Figure 3.1). Thus, in deep water, a single multibeam track can be up to 20 km wide. As a result, sectors of the seabed are fully covered by a dense network of depth soundings that yield highly accurate images and charts (Figure 3.2).

As multibeam data are collected, side-scan sonar systems may be deployed to produce photographic-like images of the seabed surface. Termed *sonographs*, the images are used to identify zones of rock, gravel and sand, structures such as sand waves, and human-made objects ranging from shipwrecks to other cables. These images, together with multibeam data and seabed photography, have also been used successfully to map benthic habitats and communities (e.g. Pickrill and Todd, 2003). If cable burial is required, seismic sub-bottom profilers are deployed to measure the type and thickness of sediment below the seabed as well as possible natural hazards (Chapter 6). Like echo-sounders, the seismic profilers direct acoustic energy from the ship to the seabed. However, instead of just echoing off the seabed surface, the energy also penetrates through the substrate and reflects off layers of sediment to produce records of their thickness and structure. Sediment coring and other geotechnical testing of the seabed are also generally conducted to help determine its stability and suitability for cable burial.

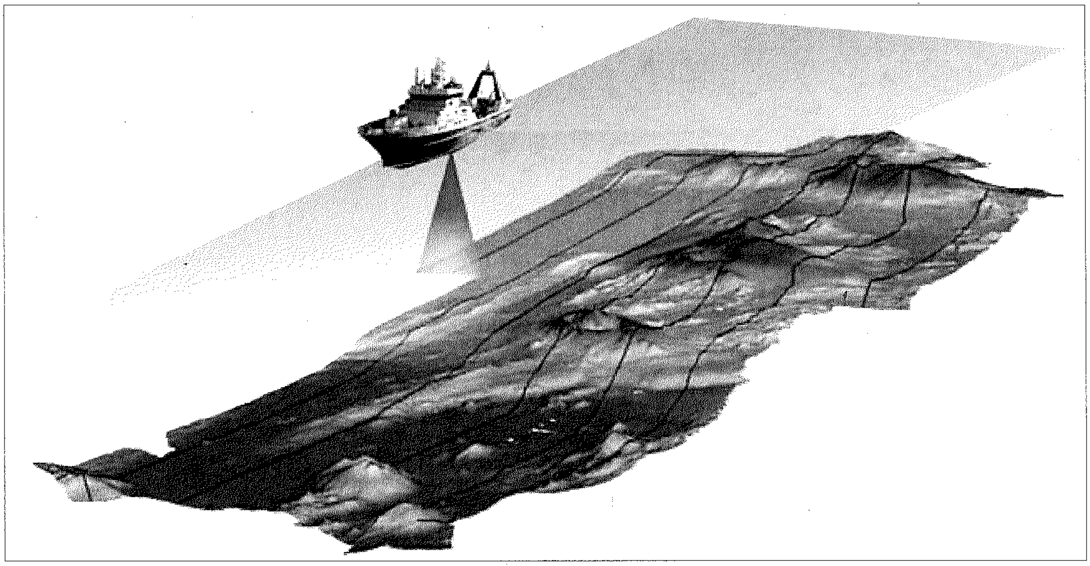


Figure 3.1: 'Mowing the lawn': a survey ship, equipped with a multibeam mapping system and guided by satellite navigation, charts the seabed to provide total coverage with depth soundings along a swath of seabed that can be 20 km wide. *Source: NIWA.*

For depths where burial is not required, a single track of a vessel using multibeam bathymetry will generally suffice. The data acquired during such surveys are constantly monitored so that if an unexpected hazard, cable obstruction or benthic community is identified, the surveyors can immediately adjust the planned route and detour around any hazardous or ecologically sensitive areas.

Ultimately, the desktop and field surveys will define a viable cable route and identify the natural and human activities that could impinge on the cable. This information guides the cable design so that it meets the specific conditions of the route.

CABLE DEPLOYMENT

As a cable enters the water, its path to the bottom is affected by the marine conditions and any variation in the operations of the laying vessel (Roden *et al.*, 1964). These can be distilled into three key parameters, which are: the ship's speed over the ground, the speed of the cable as *payed out* from the cable ship, and water depth (other less important factors are not covered here). Initially, a cable must be payed out slowly, with the vessel moving 'slow ahead' until the cable reaches the seabed. This is the *touch-down point*. Then the ship can increase its laying speed up to a practical maximum of about 11–15 km/hr (6–8 knots), periodically slowing down to pass repeaters or amplifiers through the cable-handling machinery that controls cable tension and pay-out speed. Once a steady state is achieved, the cable pay-out speed should approximate ship's speed plus 2–3 per cent, assuming the seabed topography is fairly constant. In this steady state, the catenary of the cable will be minimized in the water column. Laying up-slope, however, requires the pay-out speed to be less than the ship's speed because the water becomes shallower. The opposite is true when laying down-slope, because as water depth increases, more cable is needed to

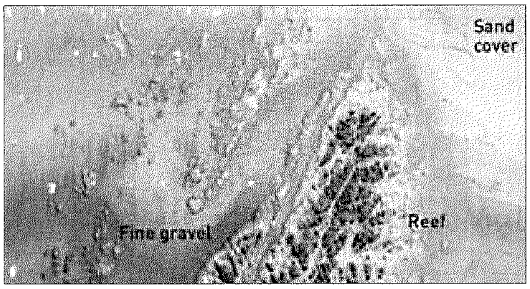


Figure 3.2: A detailed multibeam image of a rocky reef, fractured by faults and joints, and surrounded by a zone of fine gravel that is overlain by a 1 m-thick layer of mobile sand. Ideally, a cable would be buried below the sand and gravel along a route designed to avoid the rocky reef. *Source: NIWA.*

reach the seabed at the engineered touch-down point, assuming the ship's speed remains constant.

Laying operations on a modern vessel undergo constant and accurate monitoring. The ship's position and speed over the ground are measured by the satellite-based differential global positioning system, and the water depth by precision echo-sounders and seabed mapping systems (see *Route survey*), whereas cable pay-out speed and length are recorded by a *rotometer*. Onboard, the cable engineer scrutinizes laying progress with constant reference to the engineered route plan, making adjustments if necessary. In addition, there may be computerized tracking of the entire laying operation that includes detection of external factors such as winds and ocean currents, plus the means to correct for such influences.

Once laid, the cable comes ashore and is connected to the terminal or cable station, which assumes full management of the telecommunications system (Figure 3.3).

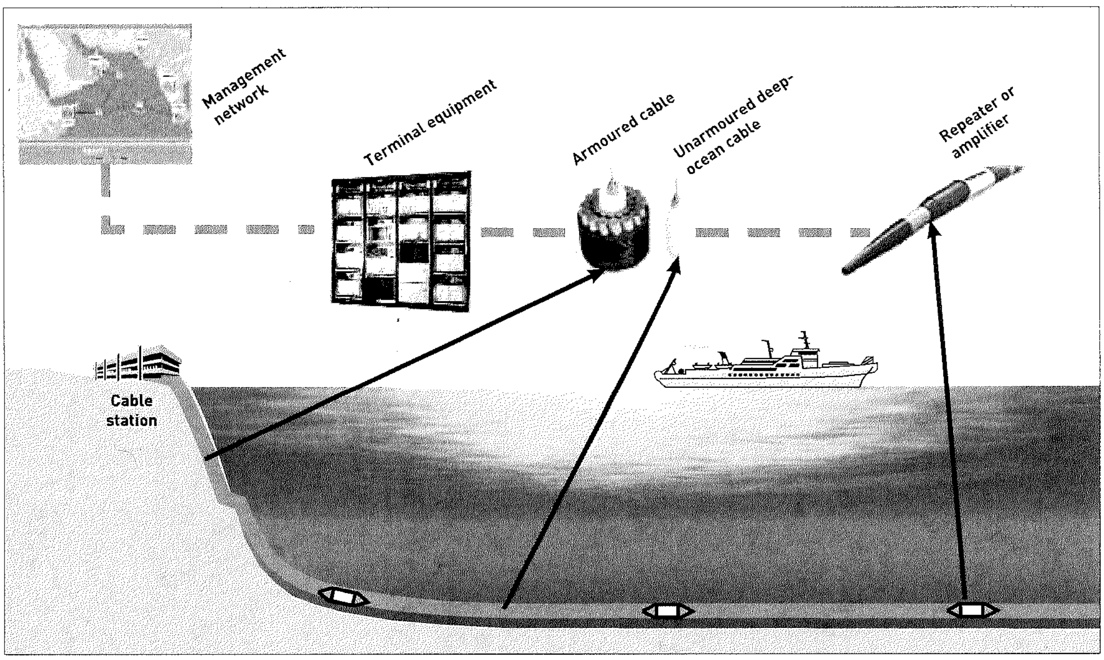
FROM COAST DOWN TO c.1,000–1,500 m WATER DEPTH: THE NEED FOR PROTECTION

Cables that extend across the continental shelf (typically 0–130 m deep) to a depth range of c.1,000–1,500 m, are commonly buried below the seabed to protect them from damage by other seabed users (Chapter 7). The most effective method of burial is by *sea plough* (Figure 3.4). As a cable approaches the seabed, it is fed through the plough, which inserts the cable into a narrow furrow. Different plough designs are available to suit various bottom conditions, e.g. the traditional plough-share is well suited for muddy substrates, whereas sandy sediments may require a plough equipped with a water jet to cut a trench into which the cable is placed. Burial disturbs the seabed along the narrow path of the cable, and this is discussed in Chapter 5.

When towing a sea plough, the ship carefully controls its operations so that cable slack is kept to a practical minimum as it enters the plough. The aim is to lay the cable with near-zero slack, but with enough looseness to fall into the furrow. In areas where the cable crosses another cable or a pipeline, the plough must be either recovered or 'flown' over the crossed section and then re-deployed on the opposite side. These skipped sections may be buried later, either by divers or by a remotely operated vehicle (ROV) fitted with trenching and burial tools as well as video and navigational aids (Figure 3.5).

Even with the latest sea plough and ROV technology, there are areas of seabed where burial is either impractical or impossible, e.g. rugged, rocky zones (Figure 3.2). In such areas, cable pay-out must be regulated to minimize suspensions between rock ridges. At the same time, slack cannot be excessive because heavy, stiff armoured

Figure 3.3: Summary diagram of a submarine cable system. *Source: UK Cable Protection Committee.*



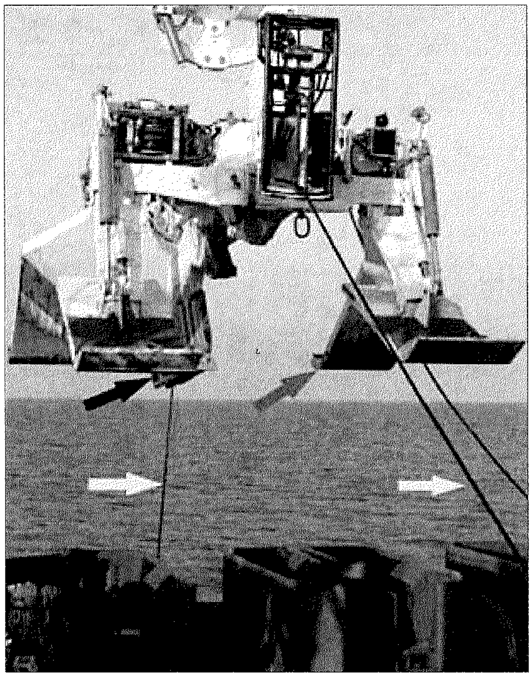
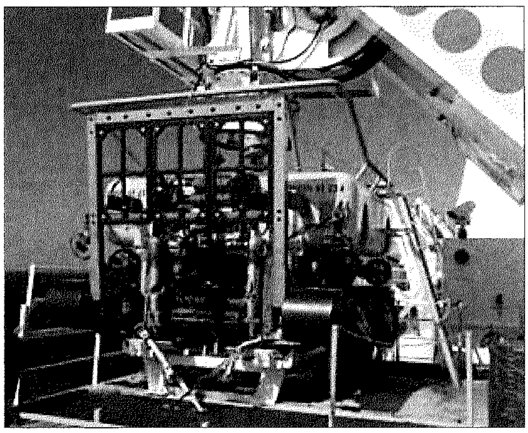


Figure 3.4: A sea plough about to be deployed from a cable ship. The fibre-optic cable (yellow arrows) is fed into a furrow cut by the plough-share (black arrow), which is towed across the seabed on skids (red arrow). *Source: Alcatel Submarine Network (ASN) now Alcatel-Lucent.*

Figure 3.5: TRITON ST-214 remotely operated vehicle (ROV), which is designed to assist burial of cables in areas inaccessible to a sea plough. It also performs cable inspections and recovery operations. *Source: Lonnie Hagadorn.*



cables (necessary for such rugged areas) may form loops if pay-out tension is allowed to approach zero at the touch-down point.

Cable deployment may be followed by a post-lay inspection to ensure that the cable is emplaced correctly either on or into the seabed (Figure 3.6). In shallow water down to c.40 m depth, inspections may be carried out by divers, whereas deeper-water inspections are usually made by an ROV equipped with video and digital cameras whose images are viewed on the surface control vessel in real time (Figure 3.5).

Some areas of the shallow-water seabed are unsuitable for burial and where possible are avoided. However, where rocky areas or zones of high sediment mobility, e.g. surf zone, cannot be avoided, other forms of protection are available and include protective covers of rocks, concrete 'mattresses' and steel or plastic conduits, the choice of which will be dictated by operational and environmental considerations.

BELOW c.1,500 m WATER DEPTH

Below a depth range of c.1,000–1,500 m, cables are deployed mainly on the seabed, although in rare instances burial may extend into deeper water (Chapter 7). This depth limit is presently the extent of modern bottom trawlers, but their forays into deeper water may necessitate burial in even greater water depths.

Typically, cable size and weight decrease with depth as the requirement for protective armour diminishes to zero. Such lightweight cables are easier to handle than armoured varieties, but cable slack must still be controlled carefully so that the cable follows the seabed contours. This may involve engineering 2–3 per cent slack into the laying procedure.

CABLE RECOVERY

Cables are retrieved from the seabed for repairs, replacement or removal (Alcatel-Lucent, 2008). Recovery may result from damage by human activities or natural events (Chapters 6 and 7), failure of components, cable age (design life is typically 20–25 years), or a need to clear congested routes. Recovery generally entails:

- location of the cable and, if a repair is required, identification of the faulted section;
- retrieval of the cable with specially designed grapnels deployed from the repair vessel;
- lifting to the surface for removal or repair.

During the haul-up process – sometimes from 1–3 m below the seabed – the strain on the cable is substantial. Thus recovery, like laying, is a complex process that takes into account a wide range of variables:

- the speed and angle of recovery;

- the ship's track along the cable route;
- the drag of the cable, which may have increased due to biological growth on the cable's exterior;
- water depth, current velocity, wave effects on vessel motion, and any natural or human-made objects, such as ship wrecks, that could potentially snag the ascending cable.

To aid this difficult process, manufacturers provide recovery tension tables that describe the maximum recommended recovery speed in a given water depth and at a given recovery angle for each cable type manufactured.

BEST PRACTICE

Most of the larger companies operating in the submarine cable industry typically work to standards and quality management systems set by the International Organization for Standards under the ISO 9000 and ISO 9001 schemes. In addition, the International Cable Protection Committee (ICPC) publishes recommendations on key issues such as cable routing, cable protection and cable recovery that are available to anyone on request. Although their observance is not mandatory, these recommendations are designed to facilitate quality improvement and are often cited by third parties as examples of best practice in the industry (ICPC, 2009). Guidelines relating to submarine cable activities are also published by the Submarine Cable Improvement Group (SCIG, 2009) and the UK Cable Protection Committee (UKCPC, 2009).

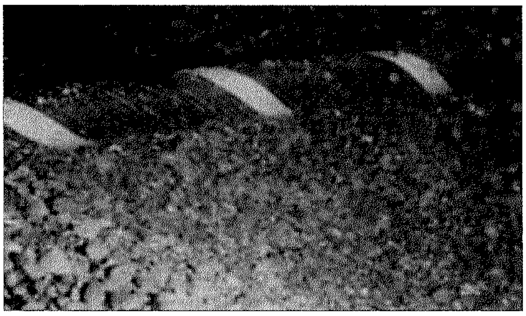


Figure 3.6: Image of a surface-laid cable taken during a post-lay inspection by an ROV. This image reveals the cable in the throes of burial by mobile gravel. *Source: Transpower New Zealand and Seaworks.*

4. International law

INTERNATIONAL CONVENTIONS

The invention of the submarine telegraph cable, and its successful use to span oceans and link nations, was immediately recognized as 'necessary to maintain the vitality of our modern international State system' and 'an interest of the highest order to States' (Twiss, 1880). The international community responded to this recognition with the International Convention for the Protection of Submarine Cables (1884) (Box 4.1).

> **BOX 4.1: INTERNATIONAL CONVENTION FOR THE PROTECTION OF SUBMARINE CABLES, 1884**
>
> The Cable Convention continues to be widely used in the cable industry. While its essential terms are included in the United Nations Convention on the Law of the Sea (UNCLOS), the Cable Convention remains the only treaty that provides the detailed procedures necessary to implement them. See:
>
> - Article 5 special lights and day shapes displayed by cable ships; minimum distances ships are required to be from cable ships;
> - Article 6 minimum distance ships are required to be from cable buoys;
> - Article 7 procedures for sacrificed anchor and gear claims;
> - Article 8 competency of national courts for infractions;
> - Article 10 procedures for boarding vessels suspected of injuring cables and obtaining evidence of infractions.
>
> Article 311(2) of UNCLOS recognizes the continued use of these provisions, which are compatible with and supplement UNCLOS.

> **BOX 4.2: CULPABLE NEGLIGENCE**
>
> The origin of the term 'culpable negligence' is found in Renault (1882), where reference is made to two early English cases: *Submarine Cable Company v. Dixon*, The Law Times, Reports-Vol. X, N.S. at 32 (5 March 1864) and *The Clara Killian*, Vol. III L.R. Adm. and Eccl. at 161 (1870). These cases hold that culpable negligence involves a failure to use ordinary nautical skill that would have been used by a prudent seaman facing the situation that caused the cable fault. Since the term 'culpable negligence' was adopted in UNCLOS without discussion, it is reasonable to assume that the same standard applies under UNCLOS.

This Cable Convention was the foundation of modern international law for submarine cables as contained in the Geneva Conventions on the High Seas 1958 (Articles 26–30) and Continental Shelf 1958 (Article 4) and, most recently, in the United Nations Convention on the Law of the Sea (1982) (UNCLOS). UNCLOS establishes the rights and duties of all states, balancing the interests of coastal states in offshore zones with the interests of all states in using the oceans. Coastal states exercise sovereign rights and jurisdiction in the exclusive economic zone (EEZ) and on the continental shelf for the purpose of exploring and exploiting their natural resources, but other states enjoy the freedom to lay and maintain submarine cables in the EEZ and on the continental shelf (Figure 4.1). In archipelagic waters and in the territorial sea, coastal states exercise sovereignty and may establish conditions for cables or pipelines entering these zones (UNCLOS, Article 79(4)). At the same time, the laying and maintenance of submarine cables are considered reasonable uses of the sea and coastal states benefit from them. Outside of the territorial sea, the core legal principles applying to international cables can be summarized as follows (UNCLOS, Articles 21, 58, 71, 79, 87, 112-115 and 297(1)(a)):

- the freedoms to lay, maintain and repair cables outside of territorial seas, including cable route surveys incident to cable laying (the term laying refers to new cables while the term maintaining relates to both new and existing cables and includes repair) (Nordquist *et al.*, 1993, p. 915);
- the requirement that parties apply domestic laws to prosecute persons who endanger or damage cables wilfully or through culpable negligence (Box 4.2);
- the requirement that vessels, unless saving lives or ships, avoid actions likely to injure cables;
- the requirement that vessels must sacrifice their anchors or fishing gear to avoid injury to cables;
- the requirement that cable owners must indemnify vessel owners for lawful sacrifices of their anchors or fishing gear;

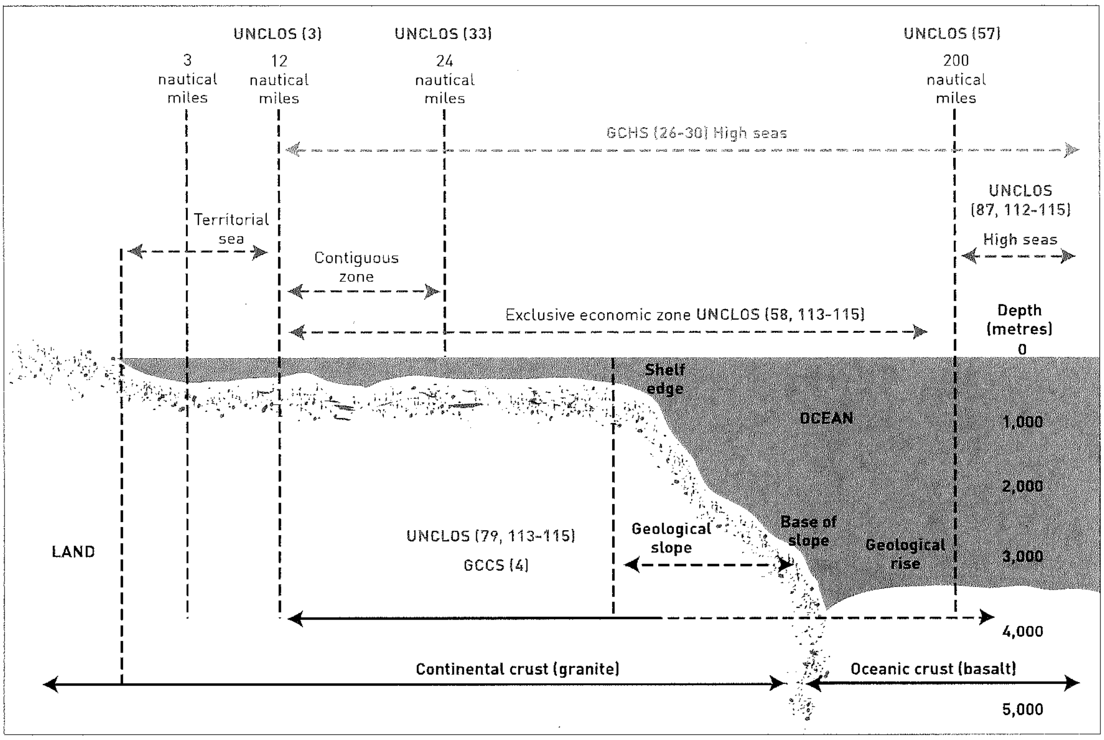
- the requirement that the owner of a cable or pipeline, who in laying or repairing that cable or pipeline causes injury to a prior laid cable or pipeline, indemnify the owner of the first laid cable or pipeline for the repair costs;
- the requirement that coastal states along with pipeline and cable owners shall not take actions which prejudice the repair and maintenance of existing cables.

These traditional rights and obligations were carefully codified by the UNCLOS drafters who were familiar with the historical state practice of cables. Parts IV to VII of UNCLOS set out the rights and obligations in the following UNCLOS designated zones: archipelagic waters, the EEZ, the continental shelf and the high seas (Figure 4.1). UNCLOS treats all cables the same, whether they are used for telecommunications or power transmission or for commercial, military or scientific purposes.

While natural occurrences such as submarine landslides or turbidity currents occasionally damage submarine cables, the most common threat to cables is other human activities, especially bottom fishing (Chapter 7). In many countries, careful route planning helps to avoid damage to cables and to cultural seabed features (Wagner, 1995). With respect to potential adverse impacts caused by submarine cables, UNCLOS indirectly takes into account their potential environmental impact by distinguishing cables from submarine pipelines, i.e. on the continental shelf it allows a coastal state to delineate a route for a pipeline but not for a cable (Article 79(3)). The reason for this distinction is that there is clearly a need to prevent, reduce and control any pollution that may result from pipeline damage. By comparison, damage to a submarine telecommunications cable is unlikely to involve pollution (Nordquist *et al.*, 1993, p 915), but may significantly disrupt international communications and data traffic.

More generally, UNCLOS, in its preamble, recognizes the desirability of establishing 'a legal order for the seas and oceans which will facilitate international communication, and will promote the peaceful uses of the oceans and seas, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment'.

Figure 4.1: Legal boundaries of the ocean from territorial sea to exclusive economic zone and onto the high seas (figures in parenthesis refer to treaty articles). *Source: D. Burnett.*



Submarine cables clearly facilitate international communication, along with freedoms of navigation and overflight. Part XII of UNCLOS establishes the legal duty of all states to protect and preserve the marine environment (Article 192). It establishes a general legal framework for this purpose, which balances economic and environmental interests in general as well as the interests of coastal states in protecting their environment and natural resources and the rights and duties of other states. To flesh out the framework, it requires states to adopt more detailed measures to ensure that pollution from activities under their control does not cause environmental damage to other states or areas beyond national jurisdiction. States shall, consistent with the rights of other states, endeavour to observe, measure, evaluate and analyse, by recognized scientific methods, the risks or effects of pollution of the marine environment (Article 204).

CABLES AS CRITICAL INFRASTRUCTURE

An emerging trend is for states to treat international cables in national maritime zones as critical infrastructure that deserves strong protection to complement traditional international cable law. In that vein, Australia, consistent with international law, has legislated to protect its vital cable links by creating seabed protection zones that extend out to 2,000 m water depth. Bottom trawling and other potentially destructive fishing practices, as well as anchoring, are prohibited inside these zones. Three international cables carry around 99 per cent of Australia's voice and data traffic and in 2002 were worth more than AU$5 billion a year to the country's economy (Telecommunications and Other Legislation Amendment (Protection of Submarine Cables and Other Measures) Act 2005; proposed regulations for submarine cables off Sydney, New South Wales (August 2006)). New Zealand has also enacted legislation that established no-fishing and no-anchoring zones around cables (Submarine Cable and Pipeline Protection Act (1966)). The trend is expected to continue because most nations depend on cables for participating in the global economy and for national security, e.g. the United States relies on cables for over 95 per cent of its international voice and data traffic, only 7 per cent of which could be carried by satellites if the cables were disrupted (Burnett, 2006). These developments sometimes go hand in hand with conservation, as restrictions on trawling to prevent cable damage can also provide direct benefits for biodiversity by protecting vulnerable seabed ecosystems and species such as corals and sponges (CBD, 2003).

Since UNCLOS, the parties to the UNESCO Convention on Underwater Cultural Heritage (2001) agreed to exempt cables from that treaty because of the specific provisions of UNCLOS and the agreement of the parties that cable laying and maintenance posed no threat to underwater cultural heritage.

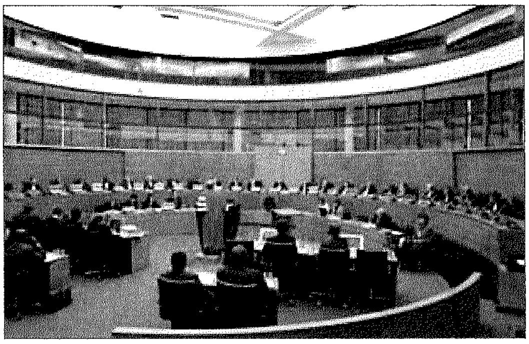


Figure 4.2: Rights and obligations relating to submarine cables in the world's oceans can be enforced in national courts or in the International Tribunal for the Law of the Sea, shown in session in Hamburg, Germany. *Source: Stephan Wallocha.*

There are numerous international conventions that build on the UNCLOS framework to further specify requirements for ocean uses such as international shipping or fisheries, but not for submarine cables. Other treaties elaborate on what states should generally do to protect and preserve the marine environment and, as embodied in the 1992 Convention on Biological Diversity (CBD), to conserve and sustainably use marine biodiversity. All of these conventions function in accordance with the UNCLOS framework, both within and beyond national jurisdiction. However, there are no conventions that further elaborate the legal framework for cables established by UNCLOS and the earlier Cable Convention.

The laying and maintenance of telecommunications cables is a reasonable use of the sea, and in 159 years of use, there has been no irreversible environmental impact. UNCLOS and state practice have provided adequate governance for international cables outside of national waters, and state practice increasingly recognizes the importance of protecting cables from activities that could damage them. The corresponding benefits of cable protection zones for biodiversity conservation have also been recognized. Yet increasing use of the oceans and seabed is likely to result in more conflicts between users (Figure 4.2). This may require future changes in the existing international legal regime. Careful planning may also be necessary to avoid adverse impacts on vulnerable seafloor ecosystems and biodiversity. Consistent with past practice and recognizing the importance of cables to the world's infrastructure, any change to the existing international law requires express provisions in an international treaty.

5. Environmental impacts

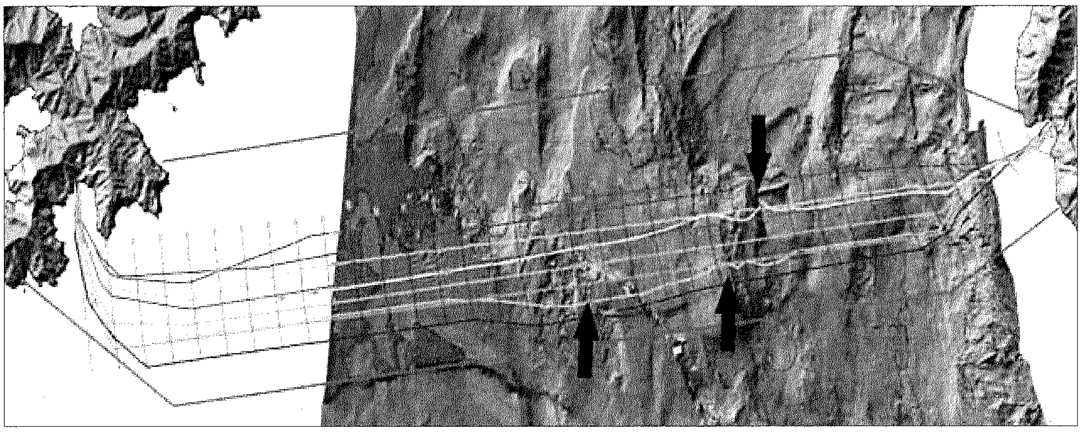
The total length of fibre-optic cables in the world's oceans is c.1 million km (J. Annals, Global Marine Systems Ltd, pers. comm., 2007). In terms of physical size, a modern cable is small (Chapter 2). The deep-ocean type has a diameter of 17–20 mm and its counterpart on the continental shelf and adjacent upper slope is typically 28–50 mm diameter because of the addition of protective armouring. Despite this small footprint, fibre-optic cables may still interact with the benthic environment. This chapter begins with an overview of the procedures for evaluating those interactions via the environmental impact assessment (EIA) process. This is followed by a synopsis of those environmental interactions of cables laid on and into the seabed, using the peer-reviewed science literature supported by open-file and published reports. The chapter concludes with some general considerations regarding cables and the environment.

ENVIRONMENTAL IMPACT ASSESSMENTS

For some countries, domestic law and regulations require an analysis of the project's effects on the natural environment. The report that is subsequently produced is commonly referred to as an environmental impact assessment (EIA). The breadth of content, level of detail and time required to undertake an EIA in relation to a proposed submarine cable project varies considerably from country to country. Nevertheless, the principle of assessing a project's effect on the environment is well established in Europe, Australasia, North America and parts of Asia and Africa.

The purpose of an assessment is to ensure that any environmental effects of cable laying and maintenance are taken into account before authorization is provided to lay a cable on the seabed (e.g. Hong Kong Environmental Protection Department, 2002; Monterey Bay National Marine Sanctuary, 2005; North American Submarine Cable Association, 2008). However, the extent to which a permit application requires an EIA depends on the regulatory process. It can range from the provision of relevant technical information and a statement of compliance with environmental accreditation, to a brief environmental review, to a comprehensive analysis that includes formal public and/or governmental consultation. Schedules for completing an assessment range from a few weeks to a year or longer. This depends on the quantity and quality of data needed, the level of documentation and consultation required, and the presence of sensitive environmental resources within the project's bounds.

Figure 5.1: Telecommunications and power cables laid on the seabed surface of Cook Strait, New Zealand, because the presence of rock and the constant movement of sediment by powerful tidal flows make it impractical to bury them. Protection is afforded by a legal cable protection zone (boundaries are grey lines on multibeam image). Even so, fibre-optic cables were displaced (arrows) by illegal fishing prior to full-time boat patrols of the zone, when such incidents ceased. *Source: Transpower New Zealand, Seaworks and NIWA.*



A formal EIA typically has five components:

1. description of the proposed operation;
2. description of the receiving environment (covering all relevant physical, geological, biological and anthropogenic/socio-economic factors);
3. evaluation of potential effects on the environment;
4. assessment of mitigating measures needed to reduce any effects to an environmentally acceptable level (i.e. spatial or temporal limitations, replacement, re-establishment or restoration of affected environments);
5. assessment of any monitoring measures needed to ensure that the extent of an effect (mitigated or otherwise) is maintained at an acceptable level.

This documentation is usually followed by a non-technical summary, which is a 'reader-friendly' synopsis for general circulation in a consultation process. As well as evaluation of existing data, an EIA may require field surveys that involve seabed mapping and sampling of sediments, rocks, fauna, flora and biochemistry (Chapter 3).

EIAs for cable operations are rare and are generally limited to a coastal state's territorial sea. The European Union EIA Directive currently does not explicitly impose an EIA requirement on cable-laying projects. That, of course, does not discount the possibility of an EIA being required as a result of a submarine cable planning application. Indeed, such applications are most likely to be routinely reviewed by the appropriate authority.

CABLES ON THE SEABED

Modern cables are usually buried into the seabed at water depths down to c.1,500 m as a protective measure against human activities (Chapters 3 and 7). However, some shallow-water cables may be placed on the seabed in areas unsuitable for burial, e.g. rock or highly mobile sand (Figure 5.1). For water depths greater than c.1,500 m, deployment on the seabed is the preferred option (Chapter 3).

Surveys

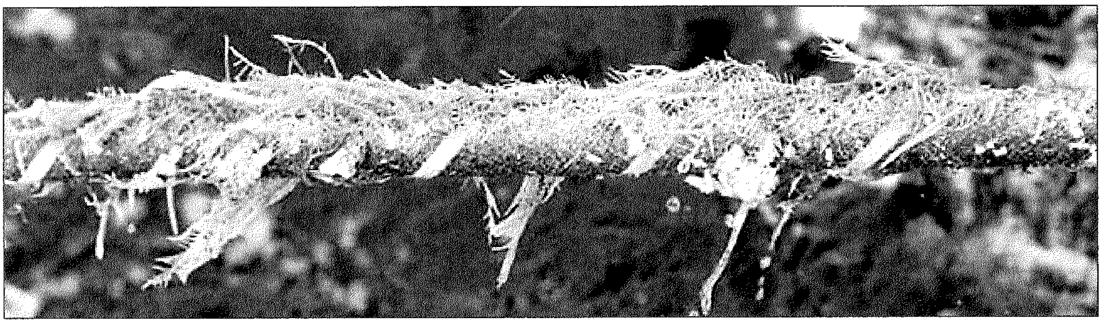
Cable route surveys rely primarily on acoustics-based echo-sounding, sonar and seismic systems. These focus on the seabed surface and, where burial is concerned, the few metres of sediment below the seabed. Accordingly, high-frequency low-energy acoustic systems are used to provide the necessary precision and detail to define a suitable route. Given our incomplete knowledge of the different responses of marine animals to different sources of noise (National Research Council, 2003), cable survey equipment is regarded as posing only a minor risk to the environment (SCAR, 2002) compared to prolonged high-energy mid-range sonar systems, which may be associated with strandings of some whale species (Fernandez *et al.*, 2005) and are the subject of ongoing research (Claridge, 2007).

Physical interactions

Surface-laid cables may physically interact with the seabed under natural or human influences. Continental shelves are typically exposed to wave and current action, including tidal flows that move sediment and result in the burial, exposure or even undermining of a cable (Figure 5.1; Carter and Lewis, 1995; Carter *et al.*, 1991). Where undermining is significant, the suspended cable can vibrate or strum under the water motions. Such actions may abrade the rocks supporting the suspension and the cable itself. Observed suspensions off California indicate that rock abrasion occurs mainly in the zone of frequent wave activity in water depths of less than c.20 m (Kogan *et al.*, 2003, 2006); abrasion marks ranged from 6 to 45 cm wide. Where the suspensions are long lived, they can be colonized by encrusting marine biota (Figure 5.2) that can biologically cement the cable to the rock suspension points.

Cables undergo self-burial that is either temporary or permanent. Where routes traverse fields of mobile sand waves, burial takes place as the sand-wave crest passes across the cable. Exhumation may follow with the passage of the sand-wave trough (Allan, 2000). Temporary burial

Figure 5.2: Surface-laid submarine cable, which has served as a substrate for the growth of epifauna. *Source: Nigel Irvine.*



also occurs nearshore, where 'fair-weather' accumulation of sand may be interrupted by storm-forced waves and currents that erode the substrate to expose a previously buried cable (Carter and Lewis, 1995). In zones of high sediment accumulation, cables can be rapidly buried by depositing sediment or simply settle into a soft substrate. Off California, for example, about half of a 95 km-long scientific coaxial cable was covered by sediment in the eight years following its surface installation (Kogan *et al.*, 2003).

Bottom trawl fishing and ships' anchoring can displace and/or damage cables (NOAA, 2005). To protect against such mishaps, cables are routinely buried beneath the seabed (Chapters 3 and 7). Where burial is impractical, a cable protection zone may be enforced whereby all potentially damaging human activities are prohibited (Figure 5.1; e.g. ACMA, 2007; Transpower and Ministry of Transport, 2008). Such measures are only as good as their enforcement, which may entail constant surveillance, including vessel patrols and electronic monitoring of all ship movements. Dialogue with other seabed users, along with public education regarding the importance of submarine cables, is also an effective protection measure (Chapter 7).

Benthic biota

Any interaction of cables with seabed life may be evaluated by assessing and monitoring the biota before and after cable installation (Andrulewicz *et al.*, 2003) or, in the case of installed cables, by comparing the biota at sites near and distant from a cable (Grannis, 2001; Kogan *et al.*, 2003). In addition, there are reports of epifauna and epiflora that live on the cables themselves (Figure 5.2; Ralph and Squires, 1962; Levings and McDaniel, 1974).

Overall, those studies demonstrate that cables have no or minimal impact on the resident biota. On the basis of 42 hours of video footage, the comprehensive study of Kogan *et al.* (2003, 2006) showed no statistical difference in the abundance and distribution of 17 animal groups living on the seabed within 1 m and 100 m of a surface-laid coaxial scientific cable. Likewise, 138 sediment cores with an infauna of mainly polychaete worms, nematodes and amphipods showed that the infauna was statistically indistinguishable whether near or distant from the cable. The main difference associated with the cable was that it provided a hard substrate for the attachment of anemones (Actiniaria). These organisms were abundant where the cable traversed soft sediment that normally would be unsuitable for such animals (Figure 5.3). Fishes, especially flat fishes, were more common close to the cable at two observational sites where small patches of shell-rich sediment had formed, probably in response to localized turbulence produced by current flow over the cable.

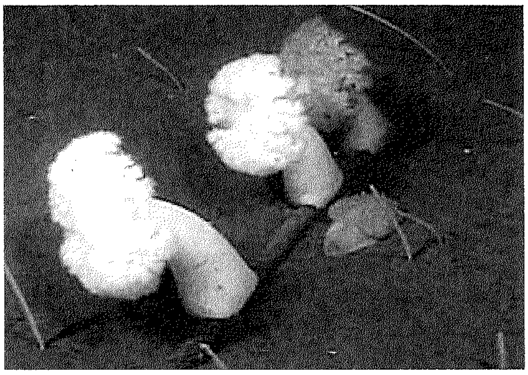


Figure 5.3: The exposed ATOC/Pioneer Seamount cable with attached anemones (*Metridium farcimen*) at c.140 m water depth. The cable provides a hard substrate on an otherwise soft seabed. The thin, erect organisms are sea pens (*Halipteris* sp.), and the mollusc *Pleurobranchaea californica* is next to the 3.2 cm wide cable. *Source: Monterey Bay Aquarium Research Institute (MBARI).*

Marine mammals and fish

Records extending from 1877 to 1955 reveal that 16 faults in submarine telegraph cables were caused by whales (Heezen, 1957; Heezen and Johnson, 1969). Thirteen of the faults were attributed to sperm whales, which were identified from their remains entwined in the cables. The remaining faults were caused by a humpback, killer and an unknown whale species. In most instances, entanglements occurred at sites where cables had been repaired at the edge of the continental shelf or on the adjacent continental slope in water depths down to 1,135 m. However, whale entanglements have nowadays ceased completely. In a recent review of 5,740 cable faults recorded for the period 1959 to 2006 (Wood and Carter, 2008), not one whale entanglement was noted (Figure 5.4). This cessation occurred in the mid-1950s during the transition from telegraph to coaxial cables, which was followed in the 1980s by the change to fibre-optic systems.

The absence of entanglements since the telegraph era reflects the following developments in cable design and laying:

- advances in design, especially the achievement of torsional balance, lessened the tendency of coaxial and fibre-optic cables to self-coil on the seabed;
- accurate seabed surveys, coupled with improved vessel handling and laying techniques, reduced suspensions and loops by laying cables under tension while following the seabed topography and avoiding excessively rough rocky substrates;

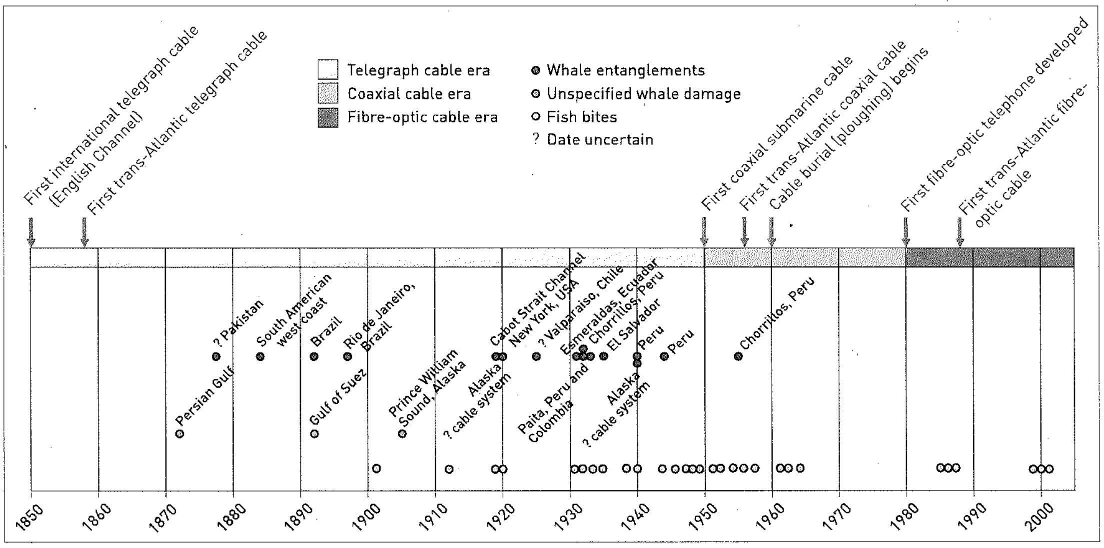


Figure 5.4: Interaction of whales and fish with submarine cables over time. The cessation of whale entanglements coincided with the improved design and laying techniques of the coaxial and fibre-optic eras. In contrast, fish bites (including those of sharks) have continued. *Source: Wood and Carter (2008) and IEEE Journal of Oceanic Engineering.*

- burial of cables into the seabed on the continental shelf and slope down to c.1,500 m water depth, which is the typical maximum diving limit of sperm whales (Watkins *et al.*, 2002);
- fault repair techniques that are designed to minimize slack cable and, if the repaired section is on the continental shelf or slope, burial beneath the seabed, usually with the assistance of an ROV.

Is the cessation of whale entanglements since 1959 possibly a consequence of non-reporting? This is unlikely because:

- whale entanglements prior to 1959 were reported in the scientific literature (Heezen, 1957; Heezen and Johnson, 1969);
- interactions with other marine animals since 1959 have been reported (ICPC, 1988; Marra, 1989);
- cable repairs are undertaken by a few specialized maintenance groups contracted to many cable owners and operators, and are therefore required to operate at high standards, which would reduce the chance of non-reporting;
- an event such as a whale capture is unlikely to escape media attention when electronic communication is so freely available, even at sea.

Fish, including sharks, have a long history of biting cables as identified from teeth embedded in cable sheathings (Figures 5.4 and 5.5). Barracuda, shallow- and deep-water sharks and others have been identified as causes of cable failure (ICPC, 1988; Marra, 1989). Bites tend to penetrate the cable insulation, allowing the power conductor to ground with seawater. Attacks on telegraph cables took place mainly on the continental shelf and continued into the coaxial era until c.1964. Thereafter, attacks occurred at greater depths, presumably in response to the burial of coaxial and fibre-optic cables on the shelf and slope. Coaxial and fibre-optic cables have attracted the attention of sharks and other fish. The best-documented case comes from the Canary Islands (Marra, 1989), where the first deep-ocean fibre-optic cable failed on four occasions as a result of shark attacks in water depths of 1,060–1,900 m (Figure 5.5). Reasons for the attacks are uncertain, but sharks may be encouraged by electromagnetic fields from a suspended cable strumming in currents. However, when tested at sea and in the laboratory, no clear link between attacks, electromagnetic fields and strumming could be established. This lack of correlation may reflect differences between the behaviour of the deep-water sharks responsible for the bites and that of the shallow-water species used in the experiments. Whatever the cause, cables have been redesigned to improve their protection against fish biting.

Leaching from cables

Modern deep-water fibre-optic cables are composed of several pairs of hair-like glass fibres, a copper power conductor and steel wire strength member, which are all

sheathed in high-density polyethylene. Where extra protection is required, as for areas of rocky seabed or strong wave and current action, additional steel wire armour is added (Chapter 2). No anti-fouling agents are used (Emu Ltd, 2004). Of these materials, cable-grade polyethylene is essentially inert in the ocean. Processes such as oxidation, hydrolysis (chemical breakdown in water) and mineralization are extremely slow; the total conversion of polyethylene to carbon dioxide and water will take centuries (Andrady, 2000). The effects of ultraviolet light (UV-B), the main cause of degradation in most plastics, are minimized through the use of light-stabilized materials, burial into the seabed and the natural reduction in light penetration through the upper ocean, where the photic zone rarely extends beyond 150 m depth. Any mechanical breakdown of a cable's plastic sheathing to fine-grained particles on the energetic continental shelf – a potential hazard for marine life (Allsop *et al.*, 2006 and references therein) – is minimized by armouring and burial.

With respect to other cable components, data on their behaviour in seawater are sparse, with the exception of a study under way at Southampton University, UK (Collins, 2007). Various types of fibre-optic cable were immersed in containers with 5 litres of seawater, which was tested for copper, iron and zinc – potential leachates from the conductors and galvanized steel armour. Of these elements only zinc passed into the seawater, yielding concentrations of less than 6 parts per million (ppm) for intact cables and less than 11 ppm for cut cables with exposed wire armour ends. The amount of leaching declined after c.10 days. Bearing in mind that tests were carried out in a small, finite volume of seawater, zinc leachate in the natural environment would be less due to dilution by large volumes of moving seawater. Furthermore, zinc is a naturally occurring element in the ocean, with concentrations in fish and shellfish ranging from 3 to 900 ppm (Lenntech, 2007).

CABLES INTO THE SEABED

Installation of cables into the seabed can disturb the benthic environment. Compared to other offshore activities such as bottom trawling, ship anchoring and dredging, disturbance related to cable burial is limited in its extent, and is a non-repetitive procedure, unless a cable is damaged (Chapter 3). The decommissioning and recovery of a buried system may also result in benthic disturbance, but again it is of limited extent and relatively infrequent, reflecting the 20–25 year design life of a fibre-optic cable. The following discussion examines the type and extent of seabed disturbance associated with cable installation, maintenance and decommissioning, followed by a brief overview of seabed recovery after disturbance.

Seabed disturbance

Route clearance

Prior to installation, any debris is cleared from a cable route by deployment of a ship-towed grapnel (NOAA, 2005; NSR Environmental Consultants, 2002). This tool penetrates 0.5–1.0 m into soft sediment and is generally not used in rocky areas. In accord with modern practice, the location of the grapnel is carefully monitored to ensure that burial follows the grapnel route as closely as possible so that the cable is installed in a debris-free zone.

Ploughing

As a plough passes across the seabed, the share opens a furrow, inserts the cable and allows sediment to fall back, thereby filling the fissure (Allan, 1998). However, the precise nature of this disturbance will vary with substrate type, depth of burial and plough type (Hoshina and Featherstone, 2001; Jonkergrouw, 2001; Mole *et al.*, 1997; Turner *et al.*, 2005). In nearshore zones including tidal flats, special ploughs are available to lessen disturbance to, for example, eelgrass and seagrass beds (Ecoplan, 2003). Disturbance is also minimized by drilling conduits through which a cable may pass beneath biologically sensitive coastal areas (Austin *et al.*, 2004). On the continental shelf, burial to c.1 m depth in soft to firm sediment typically leaves a ploughed strip, c.0.3 m wide, in which the cable is entirely covered. However, burial in consolidated substrates may result in only partial closure of the furrow, with displaced sediment deposited at the furrow margins (NOAA, 2005). The skids that support the plough can also leave their footprint on the seabed, particularly in zones of soft sediment (Chapter 3). Potential effects are increased sediment compaction and the disruption of marine fauna. Overall, the disturbance strip produced by the plough-share and skids in direct contact with the seabed ranges from c.2 m to c.8 m wide, depending on plough size.

Figure 5.5: The crocodile shark (*Pseudocarcharias kamoharai*) is a small species that grows to just over 1 m long. On the basis of teeth embedded in the Canary Islands fibre-optic cable, it was found to be a main instigator of the bite-related faults. *Source: National Marine Fisheries Service, NOAA.*

Jetting

This method is used to bury cables that are already laid. Some systems use a combination of ploughing and jetting for burial but, in general, jetting is favoured for deep parts of a route where steep slopes or very soft sediment are unfavourable for ploughing (Hoshina and Featherstone, 2001; Jonkergrouw, 2001). It is also used to rebury repaired sections. Modern post-lay burial relies on an ROV that is equipped with jets to liquefy the sediment below the cable, allowing it to sink to a specified depth (Chapter 3). The width of disturbance zones associated with jetting (liquefaction and coarse sediment redeposition) is typically about 5 m (Ecology and Environment, 2001), but fine-grained silt and clay may be dispersed further afield in plumes of turbid water. Organisms directly within the zone of liquefaction can be damaged or displaced, whereas biota near the jetting zone may receive the resuspended sediment (NOAA, 2005). Any effect on and recovery of the biota will depend on a suite of variables including the amount and particle size of the suspended sediment, ambient current and wave conditions, seabed topography, the nature of the benthic biota and the frequency of natural disturbances (see *Seabed recovery*).

Cable repairs

Around 70 per cent of all cable failures associated with external aggression are caused by fishing and shipping activities in water depths shallower than 200 m (Kordahi and Shapiro, 2004). Accordingly, cables are buried for protection, an action which, together with an increased awareness of cables by other seabed users, has produced a marked fall in the number of faults per 1,000 km of cable. Faults related to component failure have also decreased in response to improved cable system design (Featherstone *et al.*, 2001). Nevertheless, faults still occur and require repair. For buried cables, the repair procedure relies on towing a grapnel across the path of the cable, cutting the cable and retrieving both ends. Onboard the repair ship, a new section may be inserted or 'spliced' to replace the damaged cable. The repaired section is re-laid on the seabed at right angles to the original route so as to minimize slack produced by insertion of the splice (Drew and Hopper, 1996). The repair is then reburied by a jet-equipped ROV (e.g. Mole *et al.*, 1997). Where water depths permit, ROVs may also be used to retrieve damaged cables both on and below the seabed. As this technique is likely to require no or few grapnel runs, seabed disturbance is reduced.

Cable removal

As cables reach the end of their design life or become redundant due to technological advances, their removal from the seabed may be considered. In the case of a buried cable, its removal may result in disturbance, the extent of which has been assessed for offshore UK by Emu Ltd (2004). In essence, as a cable is pulled from the seabed it disturbs the sediments and associated benthic fauna. The degree of disturbance is closely related to the type of substrate, with soft sandy and muddy sediments suffering little or no impact, whereas consolidated substrates, such as stiff clay and chalk, may create fine-scale rough topography from fragments of consolidated material ejected during cable extraction. For bedrock, a cable is usually laid on the rocky surface if outcrops cannot be avoided. In that context, the cable may support an epifauna which would be lost during a recovery procedure. It may then be deemed prudent to leave the cable in place in order to preserve the epifauna.

How much do submarine cables affect the environment? A sense of context

Disturbances and impacts caused by cable laying and repairs must be viewed in the context of the frequency and extent of these activities. Clearance of debris from a path proposed for cable burial is usually followed within days to weeks by actual burial. Unless a cable fault develops, the seabed may not be disturbed again within the system's design life. Furthermore, the one-off disturbance associated with cable placement is restricted mainly to a strip of seabed less than 5–8 m wide. For comparison, bottom trawl and dredge fishing operations are repetitive and more extensive (e.g. National Research Council, 2002; UNEP, 2006). A single bottom trawl can be tens of metres wide, sweep substantial areas of seabed in a single operation and is likely to be repeated over a year at the same site. As noted by NOAA (2005), a single impact, such as a cable burial, is preferred to continuous, multiple or recurring impacts.

Seabed recovery

Seabed disturbance related to cable operations most commonly occurs in the burial zone from 0 to c.1,500 m water depth. This is also the main range of disturbance resulting from human activities as well as natural forces such as storm waves and currents, etc. (UNEP, 2006; Nittrouer *et al.*, 2007). The time taken for the seabed to recover depends on the natural dynamics of the various environments and the type of disturbance. Much of our knowledge of seabed recovery is based on studies of areas disturbed by fishing or large natural perturbations (e.g. National Research Council, 2002; Kroeger *et al.*, 2006 and references therein) with additional information provided by several cable-specific studies (e.g. Andrulewicz *et al.*, 2003; Grannis, 2001; NOAA, 2005).

Coastal zone

For coastal wetlands and inter-tidal zones, the use of various techniques to meet different environmental

conditions has helped to reduce disturbance. A specially designed, low-impact vibrating plough was used to bury a cable through salt marshes along the Frisian coast, Germany. A post-lay monitoring survey recorded the re-establishment of salt marsh vegetation within one to two years and full recovery at most monitoring sites within five years (Ecoplan, 2003). In Australia, cables crossing seagrass beds were placed in narrow slit trenches (40 cm wide) that were later replanted with seagrass removed from the route prior to installation (Molino-Stewart Consultancy, 2007). A similar technique was used for eelgrass beds in Puget Sound where cables were also installed in conduits drilled under the beds to minimize disturbance (Austin *et al.*, 2004). Soft sediment communities in artificially disturbed muddy mangrove flats recovered in two to seven months depending on the intensity of the disturbance (Dernie *et al.*, 2003). With respect to high-energy sandy coasts, any physical disturbance is usually removed within days to weeks through natural wave and current action (e.g. CEE, 2006; Carter and Lewis, 1995).

Continental shelf and slope

The continental shelf has a range of substrates and habitats that reflect:

- the amount of sediment discharged from rivers and produced directly in the ocean and seabed through biological growth;
- wave and current action that erodes, disperses and deposits sediment;
- the local geology (e.g. Nittrouer *et al.*, 2007).

Of course, these influences are themselves ultimately controlled by the climate, regional oceanography and tectonic framework. With respect to unconsolidated sediment, the amount of wave energy required to mobilize it decreases with water depth. Thus, on the inner continental shelf (typically less than 30 m deep), sand is frequently moved by swell in the presence of local currents. Sediment movement is less frequent on the middle shelf (c.30 to 70 m depth), occurring mainly during storms when swell and current activity intensifies. Finally, sediment movement on the outer shelf (c.70 m to the shelf edge at an average depth of c.130 m) is infrequent, being controlled mainly by the passage of major storms. However, movement may be more frequent at the shelf edge *per se*, where the steepened topography intensifies local currents and causes internal waves (i.e. waves formed along density surfaces under the ocean surface) to break like a normal wave on a beach.

This generalized picture of shelf behaviour is influenced and sometimes over-ridden by local conditions. For instance, the powerful tides in the North Sea, Straits of Messina, Bass Strait and Cook Strait, frequently move sediment at most shelf depths. Whatever the forcing mechanism, physical restoration of the seabed is most rapid on those shelves with a substantial supply of sediment and moderate to high wave or current action. Thus any cable-related disturbance of sandy substrates on the inner shelf is usually rectified within days to months (CEE, 2006; DeAlteris *et al.*, 1999; NOAA, 2007). Likewise, the benthic communities also recover quickly because they have natural adaptive behaviours gained from an environment subject to frequent change. Bolam and Rees (2003), for instance, show that benthic macrofaunal communities in energetic zones recovered within nine months following the dumping of dredge spoil.

Where possible, cable routes avoid zones of rocky reef because of operational difficulties in protecting cables on hard substrates and potential disturbance of reef ecosystems (e.g. Ecology and Environment, 2001; Science Applications International, 2000).

On the middle shelf (c.30–70 m depth), zones of disturbance are likely to remain longer due to less frequent wave and current activity (e.g. NOAA, 2005). However, if local currents are active, sediment movement will restore equilibrium, as observed in the Baltic Sea where a cable trench collected sand to the point that, one year after laying, any physical dislocation of the seabed was erased (Andrulewicz *et al.*, 2003). Furthermore, the post-lay inspection failed to detect significant changes in the composition, abundance and biomass of benthic animals. In the case of muddy substrates, cable-related disturbances may persist longer than in mobile sand settings. In Stellwagen National Marine Sanctuary off Massachusetts, USA, slow sedimentation had not completely infilled a cable trench one year after ploughing (Grannis, 2001). However, there was no detectable effect on the epifauna, which appears to have recovered in the one-year period. Where the cable trench passed through an area of active bottom fishing grounds, the epifauna was more abundant within the trench; a feature that was attributed to fishing-induced resuspension of fine sediment within the trench to expose gravel fragments that provided substrates for epifaunal colonization. A similar response was noted in a cable trench in Olympic National Marine Sanctuary off Washington State, USA (NOAA, 2005), where exposed consolidated sediment attracted an epifauna which, in this case, differed from the benthos in undisturbed sediment.

The speed at which a trench infills depends on:

- its depth of incision;
- the sediment supply and wave or current action to carry the material to the trench, which tends to act as a sediment sink;
- the degree of sediment consolidation, with soft sediments tending to respond readily to wave and

current action whereas consolidated materials will be more resistant.

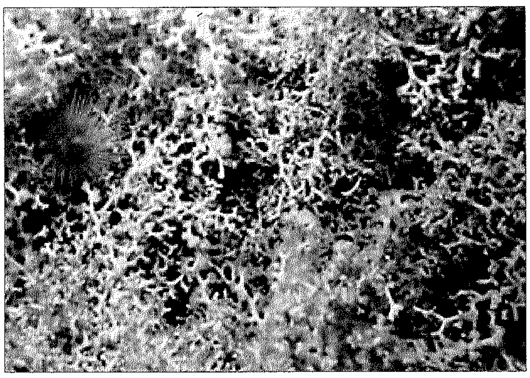
Continental shelves receiving large amounts of river mud and sand, such as those bordering the Pacific Ocean (Milliman and Syvitski, 1992), can expect several millimetres to centimetres of sediment to deposit each year. This appears to be the case on the Californian shelf, where repeated surveys of a cable trench have shown persistent accumulation and burial over four years (California Coastal Commission 2005, 2007).

On the outer shelf and upper slope (more than 70 m deep), increasing water depth and distance from shore mean that burial disturbance remains longer due to reduced water movements and sediment supply, also bearing in mind that trenches in resistant sediments will persist longer than those in unconsolidated materials (NOAA, 2005). The exceptions are very narrow shelves, where river discharges can extend over much of the shelf, and the continental shelf edge, where tidal and other currents may intensify to actively move sediment. Thus similar principles apply: mobile sediments and associated faunas will recover more rapidly than counterparts in quiet, stable settings.

CABLE PLACEMENT AND ECOLOGICALLY SIGNIFICANT AREAS

The last 15 years have witnessed substantial advances in our knowledge and understanding of deep-ocean ecosystems. International research initiatives are revealing hitherto unknown or poorly known habitats and ecosystems (Ausubel, 1999; Freiwald *et al.*, 2004; UNEP, 2005, 2006). Currently under the spotlight are seamounts, cold-water coral communities, hydrothermal vents such as those found along the volcanic mid-ocean ridges, deep-ocean trenches, submarine canyons and the lower continental slope, amongst others.

Figure 5.6: Deep-water coral thicket on Chatham Rise, New Zealand. *Source: Dr M. Clark, National Institute of Water and Atmosphere (NIWA).*



To gain an insight into the nature, role and importance of these habitats and ecosystems, deep-sea or cold-water corals are instructive as they were recently the subject of a major review (Freiwald *et al.*, 2004). Located in water depths of 40–1,000 m or more, cold-water corals occur in all the major oceans. To date, most have been found in the North Atlantic – a feature that probably reflects the intensive research and exploration efforts in that region rather than it being a preferred habitat. While their full extent is unknown, recent studies suggest that the area occupied by cold-water corals may rival or exceed the coverage of tropical reefs. Off Norway alone, cold-water reefs cover c.2,000 km^2, and on Blake Plateau, southeast of the United States, an estimated 40,000 reefs may be present (Paull *et al.*, 2000). Compared to tropical coral reefs with their massive structures and multiple species composition (up to c.800), cold-water reefs are created by only a few species (c.6), and their so-called 'reef' structure is often in the form of dense thickets that develop on rocky outcrops, sediment mounds and even coral debris (Figure 5.6). Furthermore, they are slow growing, with rates of 4–25 mm per year compared to rates of up to 150 mm per year for tropical forms.

While a full appreciation and understanding of the ecological role of these 'reef' communities has yet to be realized, they are known to provide habitats and nursery grounds for fish and other marine organisms. As a result, reefs are targets for bottom trawl fishing that can cause substantial damage. In order to conserve cold-water corals and other potentially vulnerable deep-water habitats, many countries have created (or are in the process of establishing) protected areas or closures where trawls and other bottom-contact fishing gear are prohibited (Hourigan, 2008). When extensive trawl damage was documented for the Darwin Mounds off northwest Scotland (Masson *et al.*, 2002; Wheeler *et al.*, 2004), the European Commission imposed an emergency measure in 2003 and one year later permanently prohibited the use of bottom fishing trawls and gear on the Mounds and across 1,380 km^2 of the surrounding seabed. The Darwin Mounds are now designated as an offshore marine protected area, the first in the United Kingdom and part of a developing network that is planned to extend throughout the marine waters of the European Union. The need for more research and (in parallel) for more management and protection is also reflected in the recurring themes at International Deep-sea Coral Symposia (ISDCS, 2008). These included:

- improved identification and understanding of cold-water coral reefs and the need for nationally consistent management plans;
- recognition and accommodation of seabed users,

including implementation of effective policing of marine protected areas;
- management decisions and policy for corals, conservation and human impacts.

In general terms, these themes highlight the need to use and protect the marine environment sustainably, especially in international waters beyond the jurisdiction of coastal states. In the case of submarine cables, the United Nations Convention on the Law of the Sea (UNCLOS) prescribes the freedom to lay, maintain and repair cables outside territorial seas, but these are not necessarily inconsistent with the need to protect deep-ocean habitats and ecosystems, which is also reflected in UNCLOS:

- cable deployment in the deep ocean, i.e. laying of a 17–20 mm diameter tube on the surface of the ocean floor, has a minor if not negligible one-off impact;
- cable repairs can result in substrate disturbance. However, cable failures in deep water are relatively rare and are mainly caused by major natural events such as the 2006 Taiwan earthquake and submarine landslide (Introduction). Cable repairs resulting from human and natural agents in water depths greater than 1,200 m are c.5 per cent and c.7 per cent respectively of all repairs (Featherstone *et al.*, 2001; Kordahi and Shapiro, 2004).

In addition, the submarine cable industry, together with environmental regulators, attempts to reduce or avoid any impact on vulnerable deep-water ecosystems by:

- utilizing modern seabed mapping and navigation systems that allow identification of benthic habitats in unprecedented detail and accuracy (e.g. Masson *et al.*, 2002; Pickrill and Todd, 2003). Together with modern cable-laying techniques, it is now possible to deploy cables to avoid ecologically and biologically sensitive areas;
- avoiding the deployment of cables on or through habitats such as seamounts, submarine canyons and hydrothermal vents, which are also unsuitable as cable routes due to the risk of natural hazards (Chapter 6). For example, canyons are often swept by powerful currents that may abrade or break cables (Krause *et al.*, 1970; Shepherd and Marshall, 1969); seamounts can be volcanically active and subject to landslides and hydrothermal venting.

CABLE PROTECTION ZONES AND MARINE RESERVES

As coastal states increase protection of their submarine cable infrastructure, it has been mooted that designated cable protection zones may act as *de facto* marine reserves or sanctuaries (Froude and Smith, 2004). To gauge the reserve potential of such zones, a pilot study was made of exploitable fish species inside and outside the Southern Cross cable protection zone off New Zealand (Figure 5.7; Shears and Usmar, 2006). The authors found no statistical difference in species in or out of the zone, a result that was attributed to the short existence of the zone (four years) and illegal fishing. Furthermore, a zone must offer favourable habitats for marine species. In the case of the fish populations in or near the Southern Cross protection zone, fish preferred reef habitats rather than soft sediment substrates. Although results were inconclusive, the success of established marine reserves and sanctuaries suggests that cable protection zones with suitable habitats may help to maintain and improve biodiversity and species abundance, but this concept has yet to be proven.

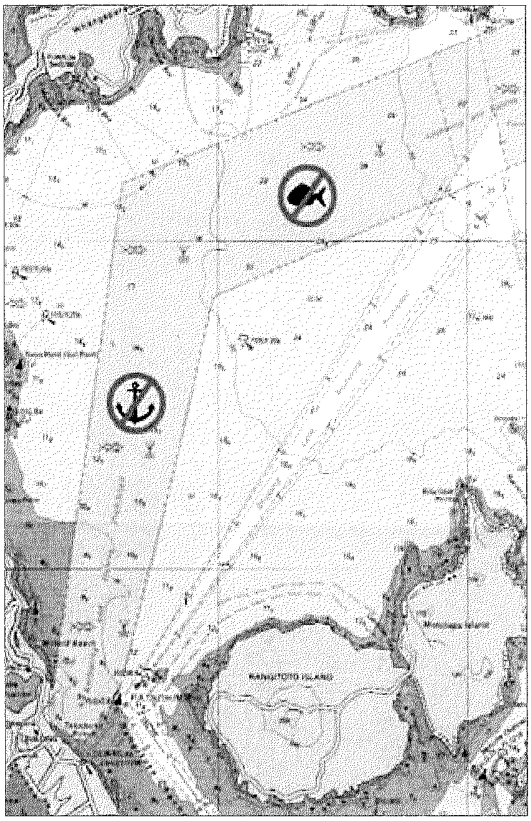


Figure 5.7: Cable protection zone for the New Zealand terminal of the Southern Cross and other international submarine cables. Such protection zones have the potential to act as *de facto* marine reserves. *Source: Telecom New Zealand.*

6. Natural hazards

LEAVING THEIR MARK ON THE SEABED

The ocean encompasses a suite of dynamic environments that extend from the coast to the abyss. All are exposed to natural hazards, which are defined here as *naturally occurring physical phenomena caused by rapid- or slow-onset events, influenced by atmospheric, oceanic and geological forces that operate on timescales of hours to millennia* (modified from UNESCO, 2006). Such phenomena include weather-related disturbances, earthquakes, volcanic eruptions and, in the longer term, climate change. And all may directly or indirectly affect the safety of submarine cables.

The continental shelf and coast have a higher incidence of natural hazards due to the frequency of meteorological disturbances, as well as less frequent events such as tsunamis and earthquakes, all of which are overprinted on longer-term effects associated with tectonic and climatic change (e.g. Nittrouer, 1999; Gomez *et al.*, 2004). As a result, coasts are exposed to flooding and erosion by surging seas and waves. The adjoining seabed may be scoured by currents and waves, or inundated by sediment as in the case of shelves fed by major rivers (Nittrouer *et al.*, 2007). Some disturbances of the seabed can occur daily, as in tide-dominated settings (e.g. Carter and Lewis, 1995), or with the frequency of severe storms, which may strike once or more per year depending on the effects of climatic cycles such as the 3–8 year El Niño-Southern Oscillation or the 20–40 year Atlantic Multi-decadal Oscillation (NOAA, 2006).

The continental slope connects the shelf edge (average depth c.130 m) with the deep ocean at 1,000 m or more (Figure 6.1). Because of the slope's depth, the influence of storms is generally less than on the shelf. However, the slope is prone to gravitational forces. Sediment destabilized by earthquakes, tsunamis or severe storms moves down-slope as landslides that range from frequent small-volume (less than 1 km^3) displacements to rare giant slides of up to 20,000 km^3 (Figure 6.2; also Hampton *et al.*, 1996; Collot *et al.*, 2001). En route, slides may transform into more fluid debris flows or turbidity currents capable of travelling hundreds to thousands of kilometres (e.g. Krause *et al.*, 1970; Piper *et al.*, 1999).

Such catastrophic events leave their imprint in the form of landslide scars, zones of jumbled sediment masses, rough seabed topography (Figure 6.2) and, where turbidity currents are active, steep-sided submarine canyons. As well as down-slope movement of sediment, the continental slope acts as a boundary that guides currents and sediment along its flank.

The slope descends to the deep ocean – a nondescript term that belies a diversity of landforms and associated environments, including seamounts (many of which are

Figure 6.1: A generalized continental margin outlining the main depth-related zones and some of the processes that shape them. HST = high systems track deposited when sea level rises and encroaches shorewards; LST = low systems track when sea level lowers and retreats seaward. *Source: MARGINS Source to Sink Program, Lamont Doherty Geological Observatory.*

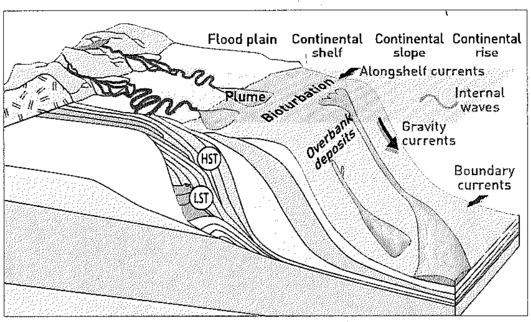
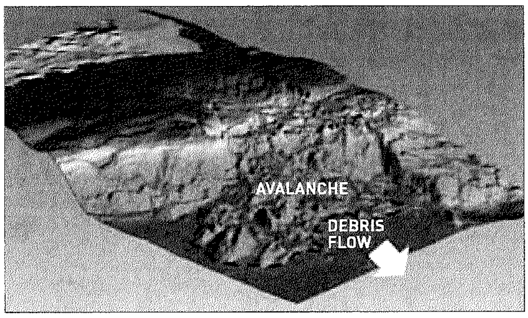


Figure 6.2: A giant submarine landslide (3,750 km^3 volume) comprising a blocky debris avalanche and a more fluid debris flow. This feature formed off New Zealand at the boundary between the colliding Pacific and Australian tectonic plates. *Source: Drs K. Lewis and G. Lamarche, NIWA.*



submarine volcanoes), mountain chains, plateaux, rises, fans and vast plains. There are also features that extend below the general ocean floor. Trenches, the deepest features on Earth, plunge several kilometres below the abyssal floor. Submarine channels may emanate from canyons incised into the continental slope, to wend their way across the ocean floor for distances sometimes exceeding 1,000 km. Each of these settings comes with its own hazards. Seamounts may be subject to volcanic activity that can form lava flows, hot-water vents, landslides and turbidity currents. Other steep-sided landforms may also be prone to landslides or erosion by currents that have intensified against marked topographic relief.

Contrary to the adage that 'still waters run deep', abyssal ocean currents can scour and transport sediment in water depths down to at least 6,000 m (Figure 6.3). Furthermore, these currents can be quite variable, with periods of steady flow punctuated by rapid turbulent pulses associated with the passage of large eddies. These are the aptly named 'abyssal storms' (Hollister and McCave, 1984).

As well as varying with depth, natural hazards differ with geography, reflecting Earth's wide range of geological, meteorological and climatic conditions. While storm-driven hazards are universal, their character and frequency are governed by local conditions. For instance, the very warm ocean temperatures of the Gulf of Mexico are a key factor contributing to the formation of hurricanes that sweep the region. Earthquakes and associated submarine landslides are also widespread, but they are most common where tectonic plates actively collide with one another, for example off Taiwan (Soh *et al.*, 2004) and New Zealand (Collot *et al.*, 2001), which are parts of the Pacific 'Ring of Fire'.

IMPACTS ON SUBMARINE CABLES

Between 65 and 75 per cent of all fibre-optic cable faults occur in water depths shallower than 200 m, and result mainly from fishing and shipping activities (Figure 6.4; Kordahi and Shapiro, 2004). By comparison, failures caused by natural hazards make up less than 10 per cent of all faults (Shapiro *et al.*, 1997). However, when focusing on deep-water cables, at least 31 per cent of faults can be traced to natural phenomena, with a further 14 per cent resulting from fish bites (Chapter 5) and 28 per cent attributed to unknown causes (Summers, 2001).

Storms strengthen current and wave action and hence increase their potential to affect cables on the continental shelf. Storm-forced movement of sand and gravel may abrade surface-laid cables (Carter, 1987) or cause suspensions in zones of moving sand waves (Allan, 2000) and on mixed substrates of rock and mobile sand. Cables laid on rock may respond to wave activity (Kogan *et al.*, 2006), resulting in abrasion, chafe and fatigue. Yet despite the dynamic nature of the continental shelf, cable failures caused by natural processes are (i) minor compared to those caused by human activities and (ii) apparently reducing in number (Kordahi and Shapiro, 2004). This decline probably relates to improved cable design, installation techniques and protection measures.

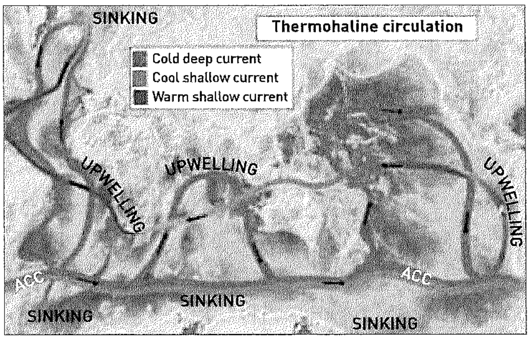
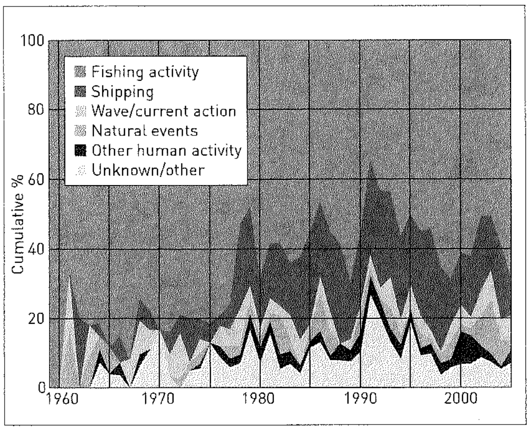


Figure 6.3: Outline of the thermohaline circulation, whose deep waters are driven by dense water sinking in the North Atlantic and Antarctica. The currents circulate around the main ocean basins before gradually returning to the surface and flowing northwards as warm surface currents under the influence of winds. The ACC is the Antarctic Circumpolar Current, which reinforces and modifies the thermohaline circulation in southern latitudes. *Source: B. Manighetti and NIWA.*

Figure 6.4: Types of cable faults recorded between 1959 and 2000. The data emphasize the dominance of faults caused by fishing and shipping activities, which typically cause damage in water depths shallower than 200 m. *Source: Wood and Carter (2008), IEEE Journal of Oceanic Engineering.*



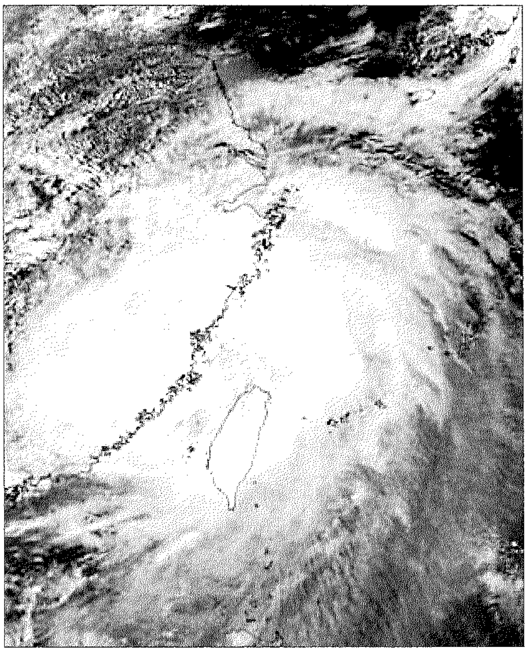


Figure 6.5: Typhoon Morakot struck Taiwan over 5–11 August 2009, when 3 m of rain fell in the central mountains, causing rivers to flood and carry large volumes of sediment to the ocean. So much sediment was discharged that several submarine landslides and associated sediment-laden 'turbidity currents' formed and broke a succession of cables off eastern and southern Taiwan as well as the nearby Philippines. While records of such events are insufficient to identify trends, the enhanced precipitation of Typhoon Morakot is consistent with warmer regional air and ocean temperatures. *Source: MODIS Rapid Response, NOAA.*

Cables can be damaged during hurricane, cyclone and typhoon attack (e.g. Cable and Wireless, 2004). However, most reports are from media sources that lack technical information on the precise nature and cause of cable damage. This was not the case for Hurricane Iwa (1982), whose impacts were recorded by ocean-current sensors on the continental slope off Oahu, Hawaii (Dengler *et al.*, 1984). Current speeds of up to 200 cm/s (7.2 km/hr) were measured during the hurricane, and were followed by several submarine landslides which in turn transformed into the highly mobile turbidity currents. These moved down slope at 300 cm/s (11 km/hr) or more and damaged six cables. Subsequent repair and recovery operations revealed tensional cable breaks and abrasion. One cable section was unrecoverable, suggesting it was deeply buried by sediment carried down by landslides and/or turbidity currents. Most recently, the 2009 Typhoon Morakot generated sediment-laden flows that broke at least nine cables off Taiwan in water depths down to more than 4,000 m and over 300 km from the coastal area where the flows formed (Figure 6.5).

Earthquake-triggered landslides and turbidity currents are well-documented hazards. Since the classic study of Heezen and Ewing (1952), which recorded the severance of submarine cables by landslides and turbidity currents set off by the 1929 Grand Banks earthquake (Box 6.1), similar cases have been observed around the world, especially in earthquake-prone regions (e.g. Heezen and Ewing, 1952, 1955; Houtz and Wellman, 1962; Krause *et al.*, 1970; Soh *et al.*, 2004). Krause *et al.* (1970) also demonstrated the long distances and great depths covered by cable-damaging turbidity currents. In this instance, slides were triggered by an earthquake, probably near the Markham River delta off Papua New Guinea, and the resultant turbidity currents disrupted cables at least 280 km away in water depths of over 6,600 m. From the elapsed time between the earthquake and cable breaks, current speeds of 30–50 km/hr were derived. More recently, cables were damaged off (i) Algeria, following the 2003 Boumerdes earthquake (magnitude 6.8), when landslides and turbidity currents damaged six cables to disrupt all submarine networks in the Mediterranean region (Joseph and Hussong, 2003; Cattaneo *et al.*, 2006) and (ii) southern Taiwan, in 2006, when nine cables broke under an earthquake-triggered flow (Renesys Corporation, 2007; Hsu *et al.*, 2009) (Introduction).

Tsunami or seismic sea waves may disrupt services, especially at coasts susceptible to wave attack. Following the tsunami generated by the Andaman-Sumatra giant earthquake on 26 December 2004, land-based telecommunications networks were damaged in coastal Malaysia and South Africa, and there is one possible case of a submarine cable off South Africa being damaged by tsunami debris washed offshore (informal media sources; Strand and Masek, 2005).

Another cause of damage to cables is the formation of suspensions (Summers, 2001). As noted earlier, currents and waves on the continental shelf cause suspensions to sway, which may result in abrasion, chafe and fatigue. However, such effects also occur in the deep sea where cables traverse zones of strong flows. Off Iceland, for example, failure of the CANTAT-3 system has been attributed to cable movement in zones of rough topography during the passage of deep currents associated with the global thermohaline circulation (Figure 6.3; Malmberg, 2004). There, flows may reach maximum speeds of 31cm/s (1.1 km/hr) in water depths of 2,500–4,000 m.

Volcanic eruptions, like earthquakes, can trigger landslides and turbidity currents, but they also have their own

brand of hazard associated with lava and volcanic debris flows. Yet despite the dramatic nature of eruptions, reports of associated cable damage are rare – a feature that may simply reflect an avoidance of submarine volcanoes by cable route planners. However, some habitable active volcanic islands, e.g. the Antilles and Hawaiian islands, rely on cables for communication. In May 1902, the eruptions of Mount Pelée, Martinique and La Soufrière, St Vincent, both in the Antilles Islands, were accompanied by a loss of submarine cable contact. The cause and location of the fault(s) are unknown, but Pararas-Carayannis (2006) speculates that the breakage may have resulted from a debris avalanche shaken from the sides of Mount Pelée.

BOX 6.1: LEARNING FROM CABLE FAILURES

On 18 November 1929, a magnitude 7.2 earthquake shook the continental slope bordering the Grand Banks off Newfoundland. Submarine telegraph cables within c.100 km of the earthquake epicentre were cut instantly by a series of submarine landslides (Heezen and Ewing, 1952; Piper *et al.*, 1985, 1999). In turn, the slides formed a turbidity current that carried c.200 km^3 of sand and mud to water depths of at least 4,500 m (Nisbet and Piper, 1998). En route, the turbidity current broke more cables, but this time in sequence. From the timing of the breaks, a current speed of 65 km/hr was estimated. Although a disaster, the data it generated provided one of the first observations on how dynamic the deep ocean can be.

CLIMATE CHANGE

In 2007, the Intergovernmental Panel on Climate Change provided projections of environmental responses to climate change through the 21st century (IPCC, 2007). The report, based on the peer-reviewed research of hundreds of scientists world-wide, is an exhaustive analysis of the world's climate – past, present and future. Since that report, new research has further refined or revised the earlier projections.

Some of the observed trends of relevance to submarine cables are as follows:

- Between 1961 and 2003, global average rise in sea level was 1.8 mm/yr, whereas from 1993 to the present the average rate is 3.1 mm/yr (University of Colorado, 2009; Chapter 8). Most sea level rise initially resulted from thermal expansion of the ocean, but more recent observations point to increasing contributions from the melting of ice sheets and glaciers (e.g. Steig *et al.*, 2009).
- The ocean has warmed to around 3,000 m depth. This vast store of heat will extend the effects of warming long after any stabilization of greenhouse gas emissions.
- The intensity of hurricanes appears to have increased since c.1970, but there is no clear trend in the numbers of these major wind storms.
- Changes have been observed in westerly wind belts, winter storm tracks, waves and weather-forced sea levels such as storm surges. These changes are projected to continue.
- Regional changes in precipitation are likely to occur and influence the flood delivery of river sediment to the continental shelf. The cable-damaging flood of Typhoon Morakot may be a harbinger of this projected trend.
- Ocean salinity (salt content) at middle to high latitudes has decreased due to increased precipitation and input of ice melt-water. This will alter the density of the upper ocean and its ability to sink and form deep currents, thus potentially affecting the global thermohaline circulation (Figure 6.3). Such a scenario is suggested by models, but is unsupported by observations, which reveal a strong natural variability in the circulation system that presently masks any long-term trends.

At present, we can only surmise any impact of climate change on submarine cables. Rising sea level may heighten the risk of erosion and flooding of coastal cable facilities, especially in regions subject to hurricanes and other intense storms. These will not only attack the coast, but also influence the stability of the continental shelf seabed via the formation of eroding currents and waves. As a result, cables laid on the seabed may be exposed to more abrasion or suspensions, although buried cables will be afforded some protection. More severe storms will increase the risk of submarine landslides and turbidity currents. A window into the future may be the disruption of the Southeast Asian cable network off Taiwan on 26 December 2006 (USGS, 2006; Hsu *et al.*, 2009). The already high river input of sediment to the ocean off Taiwan can increase three to fourfold when typhoons scour the landscape that has been destabilized by seismic and human activities (Dadson *et al.*, 2004; Webster *et al.*, 2005). As a result, thick deposits of mud and sand form on the seabed. These are ripe for disruption, as happened during 2006 (Hsu *et al.*, 2009). Regional changes in wind and rainfall will impact mainly on cables in coastal and shelf environments. For instance, increased windiness, as modelled for the middle latitudes of Oceania, may invigorate waves and ocean surface currents, thus increasing their capacity to shift seabed sediment. Large floods may

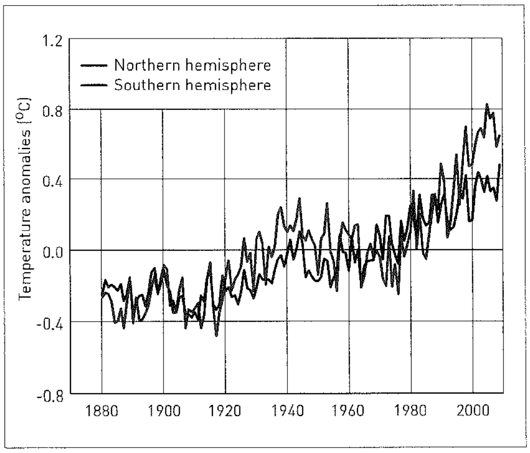


Figure 6.6: Observed temperatures for the northern and southern hemispheres, showing differences between the land-dominant north and ocean-dominant south, plus the strong temperature variability through time, which is superimposed on a long-term rising trend. *Source: Data from Goddard Institute for Space Studies, NASA.*

enhance siltation over cables or even form seabed-hugging mud flows with the potential to damage cables (e.g. Milliman and Kao, 2005).

It is important to appreciate that the ocean's reaction to global warming varies world-wide, reflecting the myriad of local and regional settings. For instance, most of the surface ocean has warmed in a patchy way by 0.1 to 1.0°C, but some sectors of the mid-latitude southern hemisphere have cooled by -0.1 to -0.5°C over the same period (NASA, 2006). This spatial variability is accompanied by strong variations over time. Natural cycles such as the El Niño-Southern Oscillation usually override long-term trends, but when these fluctuations are averaged out, the overall rise of temperature and sea level is readily apparent (Figure 6.6; Chapter 8). Thus, any evaluation of the potential effects of present global warming on cable systems must take into account local and regional conditions. An example is the North Atlantic, where the sinking of surface water as part of the global thermohaline circulation (Figure 6.3) lowers regional sea level by c.71 cm compared to the North Pacific (Hu *et al.*, 2009). Should the sinking of surface water slow or stop, this would cause a further rise in sea level on top of that caused by ice melting and thermal expansion.

7. Submarine cables and other maritime activities

INTRODUCTION

Every day, thousands of fishing vessels, merchant ships, oil rigs, dredgers, and recreational and research vessels ply the world's oceans. In most cases, their crews are unaware of the thousands of kilometres of submarine cables that lie on and under the seabed, carrying telephone calls and internet data that are a vital part of our world.

The cables, however, are sometimes affected by these activities. Every year, around 100–150 cases of cable damage are reported. Although some damage is from natural causes (Chapter 6), most is caused by humans (e.g. Shapiro *et al.*, 1997). When we consider the global scope and intensity of fishing, maritime transportation, hydrocarbon extraction, marine research, dredging and dumping, this is not surprising.

Although interaction between cables and human activities may seem inevitable, there are many reasons and ways to minimize it. A cable failure can cause severe disruption of international communications. In July 2005, such a break interrupted the majority of voice and data transmission into and out of Pakistan (Khan, 2005). Restoration of communications by satellite was insufficient to handle the traffic volume. The effects were felt by businesses, government and the general public of Pakistan for more than 10 days before the link was restored.

In some cases, if a vessel snags its fishing gear or anchor on a cable (Figure 7.1), vessel stability and crew safety can be affected. In spite of extensive warnings from cable companies, there are still occasional cases of fishermen hauling cables to the deck and cutting them, risking damage and injury not only from the weight and tension on the cable, but also from the electricity used to power the repeaters (Chapter 2).

Virtually every cable failure carries a high cost for restoration of service and repair, which must eventually be passed on to users of telecommunications services. Cable ships are kept on standby around the world, ready to respond at short notice, sail to the site of the damage and conduct repairs under all of the challenging conditions the ocean can offer (Lightwave, 2005; Sourcewire, 2000).

Fortunately, the cable sector and other mariners have found ways to cooperate and reduce cable damage. Virtually all of the ocean users capable of damaging cables also depend on the international communications they provide. This chapter explores the interactions between cables and other maritime activities, and the ways found to share the seabed in harmony and with respect.

CABLE DAMAGE

Cable damage comes in many forms. When damage is severe enough to affect transmission, it is considered a fault. One type of fault is a complete break, when a cable

Figure 7.1: Bottom trawler with trawl door (detail inset) snagging cable. *Source: ICPC Ltd.*

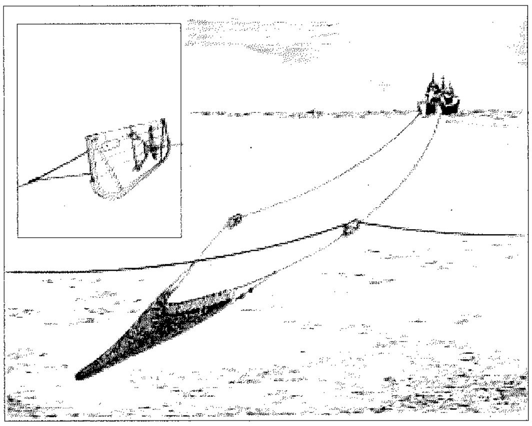
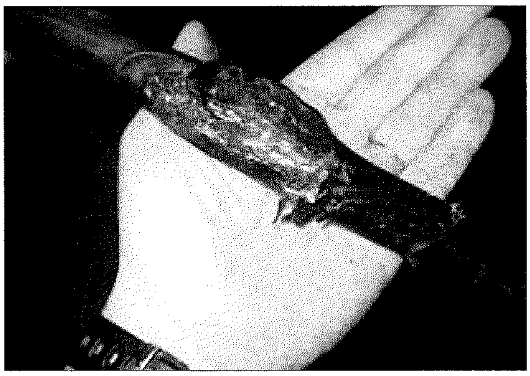


Figure 7.2: Cable damaged by fishing gear. A grapnel intended to retrieve fish traps from 1,800 m depth damaged the insulation and fibres on this cable. *Source: Tyco Telecommunications (US) Inc.*



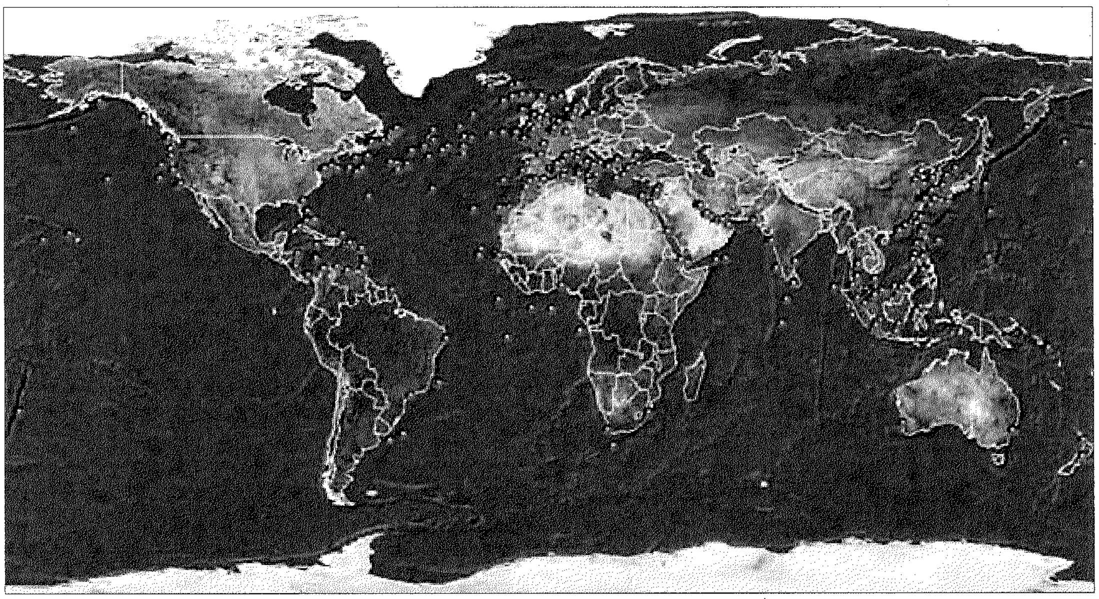


Figure 7.3: Global pattern of external aggression cable faults, 1959–2006. *Source: Tyco Telecommunications (US) Inc.*

is pulled apart or severed. In such a case, the damage obviously affects both the optical fibres carrying communications and the copper conductor carrying the electrical current required to power the signal-boosting repeaters used on long-haul cable systems.

The modern submarine telecommunications cable has an outside diameter of c.17–50 mm, depending on the type of cable and armour (Chapter 2). The breaking strength of such cables ranges from a few tonnes to more than 40 tonnes for the double-armoured types. However, a cable may be rendered inoperable by forces smaller than those needed to sever it.

If a hard object in contact with a cable penetrates the armour and insulation to expose the copper conductor that carries electrical current (Figure 7.2), the usual result is that electrical current flows to the sea to form a shunt fault. In this case, the optical fibres may remain intact and capable of carrying signals, but the repeaters beyond the shunt may lack power and the cable may stop working. Sometimes, the voltage of the electrical power feed equipment at the ends of the cable can be balanced so that the repeaters on each side of the shunt continue to function, and the cable remains in service for a short time until a repair ship arrives. Shunt faults can result from fishing gear striking a cable or abrasion on the seabed, amongst a number of causes. In other cases, such as crushing, bending or pulling, the optical fibres themselves may be damaged. An optical fault results in loss of communication on one or more fibres. When a fishing trawl, anchor or other equipment snags or hooks a cable, it may exert enough force to pull the cable apart. Whatever the cause of the fault, it normally triggers an immediate alarm in the monitoring equipment, which runs constantly in the terminal stations on shore.

NUMBERS AND CAUSES OF CABLE FAULTS

The ICPC and several private organizations maintain records of cable faults. To date, there is no central global database of all fault records, so it is difficult to know exactly how many faults occur in a given year. However, based on records spanning several decades, it may be estimated that c.100–150 cable faults occur annually world-wide. Figure 7.3 indicates the distribution of faults caused by external forces (external aggression) including seabed movement and abrasion. These patterns were taken from a global database of 2,162 cable faults going back to 1959. It is clear that most faults occur on the continental shelf, near land in water depths of less than 100 m. This is to be expected, since the vast majority of human activities that involve seabed contact take place in relatively shallow waters. The remaining faults occur across a wide range of depths, including oceanic areas more than 4,000 m deep.

When a fault alarm sounds, in some cases an air or sea patrol is dispatched immediately to determine the cause. However, in most cases the cause must be investigated by other means. Fault causes are often grouped

into the following categories: external human aggression, external natural aggression, component failure and unknown, e.g. Featherstone *et al.* (2001). External human aggression causes more faults than any other category, with fishing accounting for nearly half of all reported faults (Figure 7.4). Anchoring is the second major cause of faults, with dredging, drilling, seabed abrasion and earthquakes also causing significant numbers. However, natural hazards, including seabed abrasion, account for less than 10 per cent of all faults (Chapter 6).

Although cable systems are designed to last for at least 25 years, some components fail on rare occasions. In spite of harsh conditions of pressure and temperature, they have proved remarkably reliable, with some cables maintaining service for several decades. A recent analysis of fault causes found that less than 5 per cent of reported faults were caused by component failure (Kordahi and Shapiro, 2004). Moreover, component fault rates appear to have been falling in recent years, a fact not reflected in the summary chart (Figure 7.4), which includes data from the past five decades.

MARITIME ACTIVITIES AND CABLE FAULTS

To reduce interactions between cables and other maritime activities, some cable companies conduct extensive studies to understand these interactions. A focus on fishing is common since this is the greatest cause of damage. The goals are often to understand what areas are fished with which types of gear, and how deeply different types of gear penetrate the seabed. With this information, a cable company can more effectively plan cable routes, armouring and burial, and communicate with mariners engaged in the activities most likely to damage cables.

FISHING/CABLE INTERACTIONS

Bottom trawling

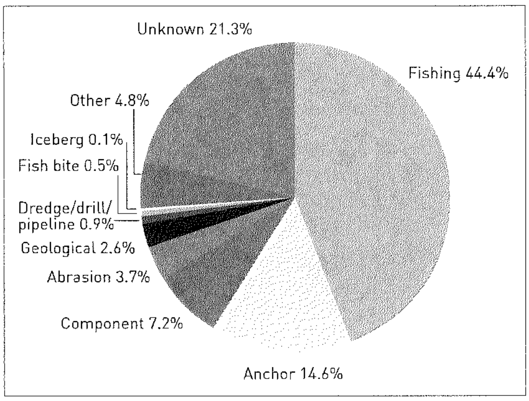
Bottom fishing is widespread on many of the continental shelves and adjacent continental slopes, and can extend to depths of c.1,500 m and more (e.g. Fishing News International, 1995; Freiwald *et al.*, 2004). Considering the thousands of fishing vessels working these shelves, and the hundreds of cables present, it is striking that interactions are relatively infrequent. Most fishing vessels never interact with cables, and many cables operate for years without faults. However, the 50–100 fishing faults experienced annually have substantial effects, disrupting communications and impacting costs (Drew and Hopper, 1996; Grosclaude, 2004).

Many different bottom fishing techniques interact with cables. This discussion will focus on the bottom trawl, because it is one of the most common types of commercial fishing gear and has a long history of cable interaction. A bottom otter trawl is a cone-shaped assembly of lines and netting that is dragged along the seabed behind a vessel (Figure 7.1). Trawl doors, also called otterboards, are steel (or steel and wooden) panels rigged ahead of the net on each side. They provide weight to keep the trawl in contact with the seabed and generate horizontal spreading force to keep the net mouth open. Otterboard weight may range from less than 100 kg per panel on the smallest trawlers to over 8 tonnes on the largest. The line along the bottom of the net is often rigged with chains, rollers, steel bobbins or rubber discs. This gear is designed to maintain contact with the seabed and stir the top few centimetres of sediment in order to capture fish and shellfish living on or just above the bottom. Estimated and observed values for seabed penetration of bottom trawls in sand and mud are typically in the range of 5–20 cm (Lokkeborg, 2005; Shapiro *et al.*, 1997; Stevenson *et al.*, 2003), but under unusual conditions such as very soft mud, uneven seabed or a rigging failure, a trawl door may dive 50 cm or more into the sediment for a short period. Fishermen try to avoid deep seabed penetration because it increases costs for fuel and gear damage without increasing catches. Rising fuel prices and pressure from the environmental community have contributed to recent trends toward development of gear with lighter seabed contact. It is worth noting that fishing gear snags on seabed obstacles are very common, and the vast majority do not involve cables.

Contact between cables and fishing gear

Several organizations have conducted extensive studies of trawl interactions with cables (Aitken, 1977; Drew and Hopper, 1996). Trawling is believed to be among the fishing methods that cause the most cable damage. This is partly

Figure 7.4: Proportion of cable faults by cause, from a database of 2,162 records spanning 1959–2006. *Source: Tyco Telecommunications (US) Inc.*



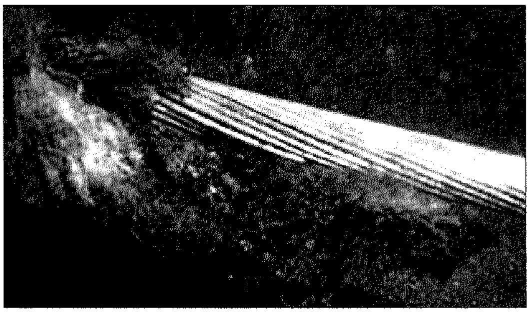


Figure 7.5: Fibre-optic cable with exterior sheathing recently damaged, presumably by fishing gear, to expose the bright steel armour, Cook Strait, New Zealand. *Source: Transpower New Zealand and Seaworks.*

because it is a widespread practice on most continental shelves, and partly because it is a mobile fishing method in which each operation may cover large areas of seabed (Lokkeborg, 2005). Research indicates that when a trawl crosses a communications cable lying on the seabed, more than 90 per cent of such crossings do not result in cable damage (Wilson, 2006). Trawls are designed to pass over seabed obstacles, and most cables in trawling depths are armoured. Cable burial and protective covers also provide greater protection and lower fault rates.

When a trawl passes over a submarine cable, a number of different outcomes are possible. As mentioned earlier, there may be no apparent contact at all. Many modern cables are buried more than 60 cm into the sediment from shore down to water depths of up to 1,500 m, so contact with normal fishing gear is highly unlikely. Even with cables lying on the bottom, trawl contact with the seabed may be light enough for the gear to pass over the cable with no discernible contact. Firmer contact may occur if a heavy trawl door, ground gear or even mid-water equipment lands on, or scrapes across, a cable lying on rocks or other hard bottom. During such contact, the armour may provide enough protection to avoid damage (Figure 7.5). Alternatively, a sharp corner of the fishing gear may penetrate the armour and insulation, causing a shunt fault, or bend or crush the glass fibres to cause an optical fault.

If a piece of fishing gear or anchor actually hooks or snags a cable, the likelihood of damage is far greater. Cable damage by bending, crushing and stretching can occur long before the cable breaks. This is one reason why cable companies discourage mariners from using anchors, grapnels or other equipment to drag for lost or unmarked gear near cables. In many areas, normal fishing gear may present almost no risk, but as soon as a grapnel is deployed to retrieve lost gear, the risk becomes extreme.

During installation in risk areas, every attempt is made to protect modern cables, either through burial into the seabed or by laying them flat on the seabed. Cable engineers constantly try to provide enough slack in a cable to let it conform to the seabed without leaving the cable loose enough for its inherent torsion to cause loops and kinks. This normally results in cables remaining in some permanent tension after installation. Consequently, in rocky or uneven seabed or on steep slopes, parts of a cable may be suspended above seabed depressions. If a piece of fishing gear contacts a suspension, a snag is more likely to result.

Cables can be more susceptible to damage in deeper waters. As water depth increases, cable burial generally becomes more difficult because of uneven seabed, steep slopes and the limitations of burial tools. Heavily armoured cable is harder to deploy in very deep water, so cables in deep water tend to carry less armour. A striking example of deep-water cable vulnerability is seen in interactions between cables and static fishing gear such as pots used for fish and shellfish. In shallow water, relatively few faults are believed to be caused by such static gear. Most shallow-water fish pots are light, and at these depths cables are armoured and generally buried. In deep water this situation is reversed – the static fishing gear is much heavier, often carrying large anchors, while the cables tend to have less armour and reduced burial depth. In some deep-water areas it also appears more common for fishermen to drag grapnels to retrieve static gear, and this greatly increases the risk. In recent years a number of faults have been caused by fishing activities using static gear in water depths of 500–1,800 m.

Fortunately for cables, most bottom fishing occurs in water depths of less than 100 m. The costs and risks associated with such fishing tend to increase with depth. With depletion of coastal resources, development of fishing technology and markets for new species, the 1980s and 1990s saw major increases in deep-water fishing (e.g. Pauly *et al.*, 2003). In a few areas, bottom trawling has extended to 1,500–1,800 m depths and bottom longline fishing with baited hooks may go even deeper. However, at such depths it appears that there are few areas with abundant fish populations of commercial value apart from those associated with elevated topography such as seamounts (Clark *et al.*, 2000). These features are routinely avoided in routing submarine cables, which may be a factor contributing to lower numbers of fishing and cable interactions in deeper waters.

During cable installation, there are rare instances of other types of interactions between cables and fishing gear suspended in the water column. In temperate and tropical oceans, fishermen catch tuna, swordfish and other species with mid-water longlines suspended from buoys. These longlines may range in length from a few hundred metres to

over 100 kilometres (Beverly *et al.*, 2003), and they can be difficult to detect. If a lightweight cable is inadvertently laid over such a line, damage to both line and cable is likely. For this reason, cable companies generally try to notify all vessels in the area of cable installation, and clear the cable route before installation proceeds. In a similar fashion, faults have been caused by cables inadvertently installed over or near fish aggregating devices (FADs). A FAD is a buoy or raft, normally anchored, which serves to attract fish that live in mid-water or near the surface. Fishermen using this gear periodically visit it to fish with hooks or nets. Some FADs are identified by substantial marker buoys, but others are less conspicuous. If a lightweight cable is laid over the buoy line of a FAD, that line can easily chafe through the cable. Moreover, when the buoy line of a FAD parts, the anchored portion of that line may be difficult or impossible to retrieve. The abandoned buoyant line may remain suspended in the water column and present a long-term hazard to the installation of lightweight cables.

RISKS TO FISHERMEN AND VESSELS

When a cable is faulted, the cable company commonly receives no notice from the mariners involved and it is unclear whether those mariners are even aware of the interaction. In some cases the repair ship will find anchors or fishing gear snagged on the cable. Although many fishing and cable interactions appear to occur without negative effects on fishermen and vessels (and in some cases without their knowledge), there is danger associated with catching cables.

When gear fouls a cable, the gear may be damaged or lost completely. Any catches contained in nets are likely to be lost. If a fisherman tries to lift the cable to free his gear, the danger may increase. After an initial amount of slack is taken up, the load on the gear may rise dramatically, exceeding the capacity of the vessel's winches and causing damage. This can also affect a vessel's stability and, in extreme cases, risk capsizing. If fishermen succeed in bringing an active cable on deck, there is also a risk of electrocution (Figure 7.6).

OTHER CAUSES OF CABLE DAMAGE

After fishing activity, the most common cause of cable faults is vessel anchors. A 5,000-tonne vessel with a 4-tonne anchor may be expected to penetrate soft sediment to a depth of 5 m (Shapiro *et al.*, 1997). If such an anchor lands on a cable or drags and hooks a cable, a fault is likely. For smaller vessels, the pulling force on a snagged anchor may exceed the weight of the anchor by a wide margin. Such force may approach the breaking strength of the anchor line, the capacity of the anchor winch, or the buoyant force on a small vessel. Engineers avoid planning cable routes in or near charted anchorage areas, but vessels may also anchor in uncharted zones. Anchor faults tend to be most concentrated near busy ports, though on occasion they also occur over widespread areas.

Cable faults are occasionally caused by dredging associated with beach replenishment, sand or mineral extraction, etc. Other offshore activities such as petroleum extraction, pipeline construction, scientific research and dumping all lead to occasional cable breaks. Many of these may be avoided when the mariners involved consult charts showing cable routes, or request information from cable companies, but due to the intensity of marine activities (Figure 7.7) on a global scale there are still frequent faults.

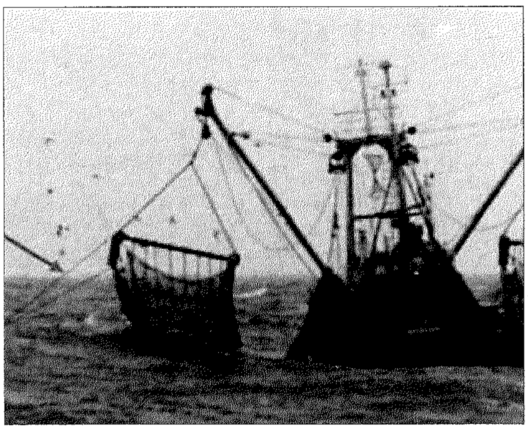
MITIGATING FISHING AND CABLE INTERACTIONS

Over time, cable companies and other marine interests have found ways to mitigate their operational interactions. Careful planning of new cable routes is an essential first step. Charted anchorages and dredge areas are avoided. Maritime authorities and permitting processes may help. In many cases, industries such as fishing and merchant marine associations are consulted directly. These can often offer detailed information about local risks and potentially safer cable routes. However, despite cable planners' best and extensive efforts, it is not always possible to gather complete information on all uncharted areas where vessels may anchor, dredge, fish or conduct other activities.

Charts, notices to mariners and fishermen

If fishermen and other mariners are informed about the importance and locations of cables, in many cases they will

Figure 7.6: Beam trawler with gear snagged on cable (arrow). Snags cause trouble for fishermen, cable companies and users of communications services. *Source: Tyco Telecommunications (US) Inc.*



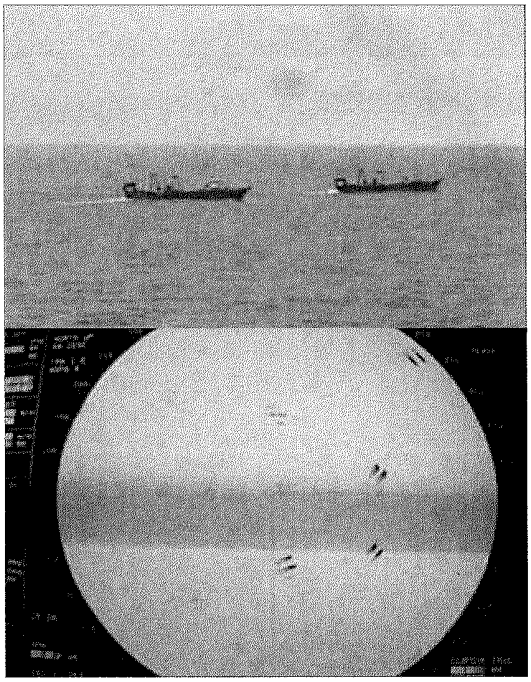


Figure 7.7: Pair trawlers observed and seen on the radar of a cable ship in the East China Sea. Avoiding and repairing cable faults can be difficult with this intensity of fishing effort. *Source: Tyco Telecommunications (US) Inc.*

take measures to avoid damage. An essential first step in informing mariners is publication in official notices to mariners and nautical charts, which are distributed by hydrographic and other authorities in various countries, e.g. ACMA (2007). However, there are limitations on this distribution system for some groups of mariners, e.g. coastal fishermen using small vessels who may not keep charts onboard. The period immediately after installation may also be difficult because distribution depends on the frequency of issue of the nautical charts and other notices in the local jurisdiction. In recent years, the trend towards electronic charts raises the possibility of more rapid publication of new cable information.

Many companies distribute additional information such as chartlets, brochures, leaflets or flyers showing cable routes and cable company contact information, highlighting the importance of avoiding damage to the communications infrastructure (e.g. Transpower and Ministry of Transport, 2008). This unofficial information distribution in some regions extends to distribution of electronic files for plotting cable routes on fishermen's navigation systems. It may begin before cable installation starts, depicting planned cable routes and advising mariners of upcoming installation activities. Representatives of cable companies sometimes attend fishermen's meetings and trade shows, or work through nautical suppliers to distribute such information.

Fishing and cable working groups

In some areas, the longstanding dialogue between cable companies and fishermen has been formalized into committees that exchange information and develop guidelines for recommended practices. These have developed new channels for information distribution, and in some cases developed guidelines for fishing more safely in areas where cables are present (OFCC, 2007; UKCPC, 2009). Among the issues they sometimes address is the use of 'cable-friendly' fishing gear – trawl doors and other gear built without sharp edges or notches that could snag cables. All parties have benefited from the understanding and working relationships that have developed from such groups.

8. The changing face of the deep: a glimpse into the future

The ocean is in a constant state of flux as it responds to a range of natural forces that operate on time scales of hours (weather) to millions of years (continental drift). But the ocean is now out of its 'comfort zone' as it faces unprecedented pressure from increasing human activities offshore and the effects of modern climate change (Halpern *et al.*, 2008; IPCC, 2007). Those pressures, along with a rapidly growing knowledge of the oceans, have fuelled a greater awareness of the marine environment and the problems it faces. This, in turn, has instigated efforts to conserve and protect marine resources, ecosystems and biodiversity (e.g. Freiwald *et al.*, 2004; Ministry of Fisheries, 2007). So what does the future hold, especially in the context of submarine telecommunications? Niels Bohr noted that 'Prediction is very difficult, especially about the future', but given the current state of the ocean (Halpern *et al.*, 2008), it is important to at least reflect on the future, guided by current trends and model simulations of change.

HUMAN ACTIVITIES

Fishing

As outlined previously, bottom trawl fisheries pose the greatest threat to submarine cables. During the 1980s, these fisheries extended into deep water in response to reduced stocks on the continental shelf (Smith, 2007b). Now, trawl fisheries can operate in water depths to 1,500 m and more, especially over submarine elevations such as seamounts and ridges. Future trends are unclear, but in some regions fishing effort and extent have waned due to:

- 'boom and bust' cycles, as illustrated by the orange roughy boom, when catches in the South Indian Ocean peaked at 39,000 tonnes for the year 2000, to be followed by a dramatic reduction to under 5,000 tonnes just two years later (Smith, 2007b);
- environmental degradation (Figure 8.1) coupled with declining fish stocks and by-catch issues, which have led to the closure of fishing areas and restrictions on gear type, e.g. areas off the United States are closed to protect benthic ecosystems (National Research Council, 2002; Pacific Fishery Management Council, 2005);
- the rising cost of fuel, which has been mooted as a market-driven control on energy-intensive deep-sea fisheries (Pauly *et al.*, 2003).

Figure 8.1: Trawl scars on the Chatham Rise, Southwest Pacific Ocean. *Source: Dr Malcolm Clark, NIWA.*

Any reduction in bottom trawl fishing should potentially lessen the threat to the cable network. However, actual benefits to the network will depend on the nature, timing and location of any reduced effort. For example, large areas of the exclusive economic zone off the western United States, including all areas deeper than 1,280 m (700 fathoms), have been closed to bottom trawl gear (Pacific Fishery Management Council, 2005). This legislative act could be expected to have an immediate benefit because the closure is regulated and takes in a major submarine cable route. In contrast, some regions could witness increased fishing effort as conservation and protection

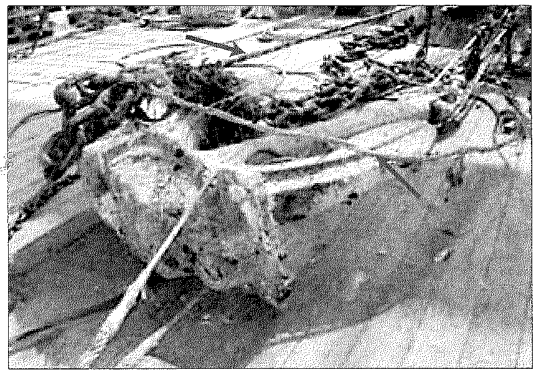
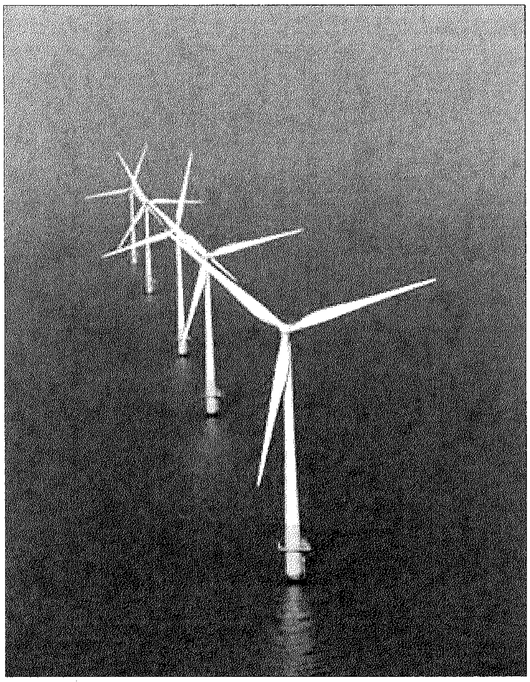


Figure 8.2: As the size and numbers of merchant vessels have increased, so has the risk of damage to submarine cables, as shown by a faulted cable (arrows) entangled with a ship's anchor. *Source: unknown.*

measures take effect and some fish species recover, e.g. NOAA (2009). Another fisheries development has been a fivefold growth in aquaculture, to a point where half the fish and shellfish consumed by humans now comes from farms, the remainder coming from fish caught in the wild (Naylor *et al.*, 2009). Continued growth of aquacultural farms is likely to add to the congestion of coastal seas.

Figure 8.3: The future is here: offshore wind farm, Kentish Flats, United Kingdom. *Source: ELSAM, Denmark.*



Shipping

After fishing, shipping activities, particularly anchoring (Figure 8.2), are the main threat to cable security. Over the last 12 years there has been a general increase in the number of ships and tonnage of the world merchant fleet (Institute of Shipping Economics and Logistics, 2005, 2007). In 2005, there were 39,932 vessels with a total tonnage of 880 million dwt (dead-weight tonnes). At the start of 2007, the fleet had grown to 42,872 ships with a total tonnage exceeding 1 billion dwt, the first time that threshold had been passed. Thus, merchant ships have become more numerous and, on average, heavier. In 2007, the fleet consisted of tankers (41 per cent), bulk carriers (36 per cent) and container ships (13 per cent), with the remainder being general cargo and passenger vessels.

Increased shipping may heighten the risk to the submarine network. Such an assessment needs to account for both those trade routes where vessel traffic has changed and the relationship of those routes to cable locations. A case in point is the rapid growth of the Chinese steel industry, which has been accompanied by growth in the bulk carrier fleet required to transport iron ore, mainly from Australia (40 per cent), India (28 per cent) and Brazil (19 per cent). Thus, cables on the continental shelves that are traversed by those shipping lanes are potentially exposed to more risk.

Renewable energy generation

Many countries are focusing on the generation of renewable energy as they seek to meet growing demand, establish secure supplies and reduce emissions of greenhouse gases. Wind farms, in particular, have become a familiar sight in coastal seas, especially off Europe (Figure 8.3). By comparison, wave- and current-powered systems are largely in the developmental stage, apart from scattered operational schemes such as the long-established La Rance tidal barrage in France (University of Strathclyde, 2002), a commercial wave generation plant installed off northern Portugal in 2006 (World Business Council for Sustainable Development, 2006) and current-driven turbines in the East River, New York, which deliver power to the local grid (Verdant Power, 2007). The outlook is for a significant expansion of offshore renewable energy schemes. Wind generation is projected to increase its operating capacity fourfold to 4.5 GW in the next five years (Douglas-Westwood, 2008). Most of this expansion will occur in Europe, where the United Kingdom is projected to replace Denmark as the leader in offshore wind generation through the proposed installation of large wind farms

in the Thames Estuary (1,000 MW) and Bristol Channel (1,500 MW) (e.g. London Array, 2007).

Mineral and hydrocarbon exploitation

World oil and gas supplies are considered inadequate (Smith, 2007a), and a common thread through forecasts is that demand will surpass supplies of conventional oil in the next few decades (e.g. Bentley, 2002). To help address this imbalance, further exploration and production may come from offshore, and indeed growth in this sector is expected until at least 2011 (International Energy Agency, 2006). This growth may be linked to increased production from existing offshore fields and the discovery of new fields in deep waters beyond the continental shelf (Kelly, 1999). New hydrocarbon sources are also under investigation with the spotlight on sub-seabed deposits of gas hydrate – an ice-like form of methane found widely beneath the continental margin (Kennett *et al.*, 2003). These deposits have been researched at ocean and coastal sites, but as yet they have not been tapped commercially (e.g. Dallimore and Collett, 2005).

Offshore mining of non-hydrocarbon minerals is a long-established practice that typically has been dominated by the extraction of sand and gravel for aggregate (Glasby, 1982). Deposits bearing gold, tin, zircon, iron, titanium, phosphate and diamonds, amongst other minerals, have also been exploited. Considerable research has been devoted to polymetallic nodules which, along with manganese and iron, contain potentially economic concentrations of copper, nickel and cobalt. These widespread deep-ocean deposits have yet to be mined commercially. Nevertheless, with an eye on declining onshore mineral resources, several government agencies and companies have formally identified exploration and prospecting areas, especially in the central Pacific and Indian oceans. These large areas are mainly in international waters, meaning that any activity is regulated by the International Seabed Authority established in 1994 under the auspices of UNCLOS (International Seabed Authority, 2009).

Associated with offshore hydrocarbon production is the potential use of depleted oil and gas reservoirs to store carbon dioxide. Sequestration is currently under way in the Norwegian sector of the North Sea, where carbon dioxide from the Sleipner West hydrocarbon field is injected into a sandstone formation 1,000 m below the seabed (Figure 8.4; Statoil, 2004). In a recent analysis of available technologies to help reduce emissions of carbon dioxide, sub-seabed sequestration was a considered option (Pacala and Sokolow, 2005). However, in order to store 1 billion tonnes of carbon annually by 2054, the authors estimated that c.3,500 Sleipner-like fields would be required. If this option were implemented it could impact on cables through the development of new sequestering sites, re-establishment of abandoned oil and gas wells, and increased ship traffic or submarine pipelines to transfer captured carbon dioxide to the storage sites.

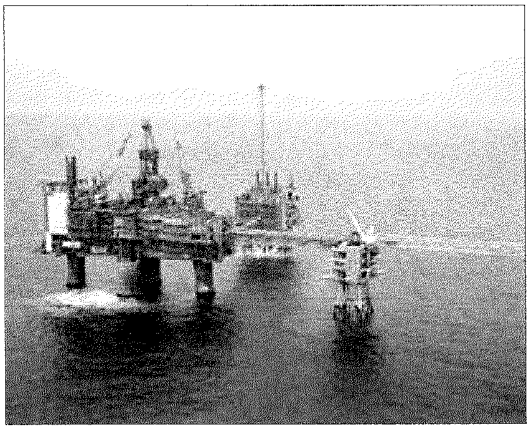


Figure 8.4: Sleipner West, the site of carbon dioxide storage in sub-seabed geological formations. *Source: Norsk Hydro.*

Ocean observatories

The last five years have been a period of growth for ocean observatories (ESONET, 2002; Joint Oceanographic Institutions, 2008; Ocean Sites, 2009). An internet-based survey reveals that the number of observatories has doubled since 2005. Presently, over 110 observatories are either operational or in development. Monitoring the ocean's interior, beyond the gaze of satellites, is a response to better identify its many environments, their living and non-living components, their functions, and their reactions to natural and human-related forces.

Observatories range from temporary, simple coastal moorings that measure a limited number of parameters such as water temperature, salinity (salt content) and current velocities to complex, permanent deep-ocean systems capable of taking a myriad of physical, biological, chemical and geophysical measurements, as well as conducting a range of experiments.

The most advanced of the large, permanent (20–25 year design life) observatories is the recently commissioned NEPTUNE system situated on the continental margin and adjacent deep-ocean floor off British Columbia, Canada (Figure 8.5; NEPTUNE, 2009). By 2008, 800 km of fibre-optic cable had been installed. This provides the communications and power to operate instruments and to transmit data back to Vancouver Island in real time, where it is made available to the scientific community and public. Several *nodes* were

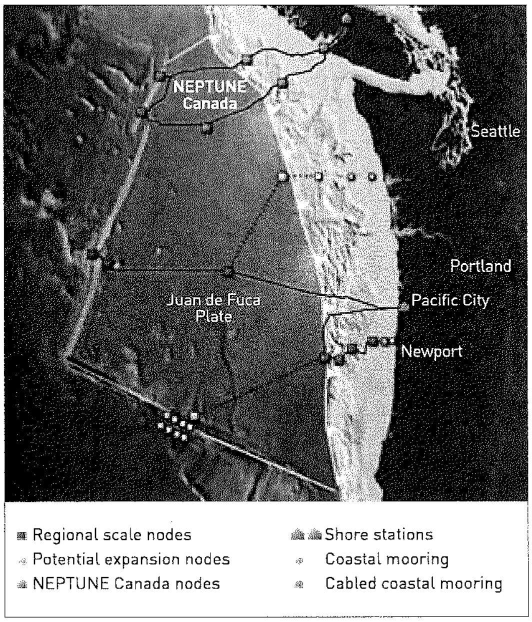
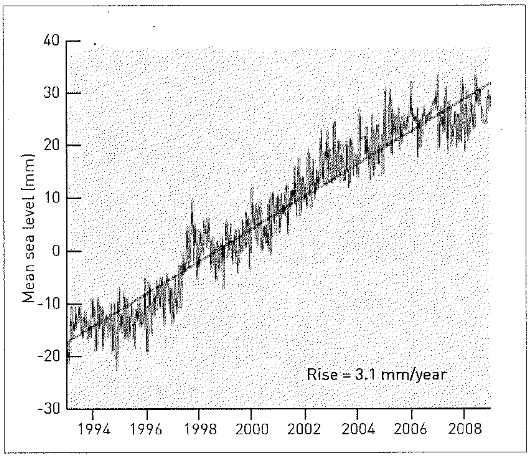


Figure 8.5: The recently installed NEPTUNE Canada cabled observatory with key monitoring and experimental sites or *nodes* (large grey squares). The proposed cabled observatory to the south is part of the US Ocean Observatories Initiative (OOI). *Source: Regional Scale Nodes and Center for Visualization, University of Washington.*

Figure 8.6: Despite variability in time and place, global mean sea level is on the rise in response to thermal expansion of the ocean coupled with increasing amounts of melt water from glaciers and polar ice sheets. *Source: Data from University of Colorado.*



installed along the cable in 2009 (Figure 8.5). These car-sized units are akin to large junction boxes that receive plug-in sensors and other instrument packages. The great flexibility of this *plug-in-and-play* approach allows NEPTUNE to conduct experiments and monitor the wide range of environments extending from the upper ocean to below the seabed. The nodes, connecting cables and sensors are placed in areas that traditionally have been avoided by submarine telecommunications cables, including active hydrothermal vents, submarine volcanoes, areas of seismic risk and rugged ocean floor. In that context, such instrumentation needs to be located precisely in order to optimize its sensitivity, as well as to avoid any impact on the surrounding environment and other sensors nearby.

Climate change

The ocean is now responding to the present phase of climate change as outlined in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2007) and more recent research (e.g. Domingues *et al.*, 2008; Velicogna, 2009). Rising sea level, more intense storms, extremes of precipitation and drought, changes in the position and strength of zonal winds such as the Roaring Forties, together with effects on ocean currents, all have the potential to impinge directly on the cable network as outlined in Chapter 6. Some changes, such as rising sea level and changing weather patterns, are already under way and are likely to be with us for some time – a situation that has resulted from warming of the ocean interior (e.g. Gille, 2002; IPCC, 2007), creating a vast reservoir of heat that will continue to influence climate even if major reductions in greenhouse gas emissions are achieved.

A more specific analysis of potential hazards posed by climate change must account for its strong temporal variability. Sea level rise will vary depending on the site and local climate. In Auckland, New Zealand, sea level fluctuates in response to El Niño-La Niña cycles and the Interdecadal Pacific Oscillation (Goring and Bell, 1999). Despite such oscillations in that sea level record and others, an overall rising trend is unmistakable (Figure 8.6).

Similarly, the ocean's responses to warmer conditions will vary with location. If future El Niño phases become more intense, those cables off western-facing coasts in the Pacific region could be up against increased winds and storms which, together with rising sea level, have the potential to exacerbate wave and current erosion of the seabed and coast. In regions of high sediment input, such as the tectonically active Pacific Rim (Milliman and Syvitski, 1992), the combination of climate and tectonic activity has already taken its toll on submarine telecommunications. The destructive sub-sea landslide and turbidity currents that accompanied the 2006 Hengchun earthquake off Taiwan

were the result of a continuing tectonic-climatic cycle of earthquake destabilization of the terrestrial landscape (Dadson *et al.*, 2004), erosion of the landscape by storms and typhoons (Milliman and Kao, 2005) and the discharge of huge volumes of sediment to the ocean (Liu *et al.*, 2008), where thick deposits of sediment are formed and later destabilized by earthquakes to generate cable-damaging landslides and turbidity currents.

Marine protected areas

Awareness of human and natural stresses on the marine environment has led governments to promote and establish various types of marine protected areas (MPAs). One of the pioneers was Australia, which set up the Great Barrier Reef Marine Park in 1975 to provide environmental protection for the reef while allowing but regulating activities such as fishing, shipping and tourism (Australian Government, 2008; Doy, 2008). In Europe, the intergovernmental OSPAR Convention seeks to protect and sustainably manage a large sector of the Northeast Atlantic Ocean (OSPAR, 2009). At the national level, the United Kingdom continues to establish MPAs such as the Special Areas of Conservation (UK Marine Special Areas of Conservation, 2009). Likewise, the United States has afforded protection status to numerous areas off its mainland and island territories (Marine Protected Areas Center, 2009).

Most MPAs are located in coastal waters, but attention is turning further offshore, including international waters, in order to protect biodiversity and ecosystems such as cold-water coral communities. This was embodied in the recent European Union Marine Strategy Framework Directive (European Commission, 2008), which is aimed at protecting the European marine environment in concert with a desire to achieve the full economic potential of oceans and seas.

Activities such as ocean surveys can be restricted in MPAs, especially if intrusive methods are proposed. Even if a survey is possible, there can be restrictions placed on cable-laying activities. Thus, cable planners take due regard and, where possible, avoid areas that are designated as environmentally sensitive, e.g. warm-water coral reefs, cold-water coral communities and seagrass meadows. Knowledge of MPAs and sensitive benthic ecosystems is essential. Increasingly, information is appearing in the published literature and internet-based databases, which include maps of threatened and/or declining species and habitats, e.g. World Database on Marine Protected Areas (2009); Marine Protected Areas Center (2009); OSPAR (2009).

Ostensibly, any expansion of marine protected areas could be viewed as a further restriction on the passage of international cables. However, cables and marine protected areas may not be mutually exclusive. A surface-laid cable, beyond the depth of wave and current disturbance, has a

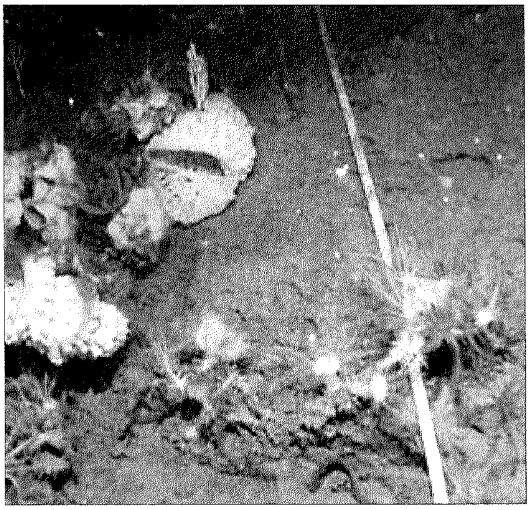


Figure 8.7: The ATOC scientific cable on Pioneer Seamount next to brightly coloured sponges, soft corals and feathery crinoids. *Source: 2003 Monterey Bay Aquarium and Research Institute (MBARI).*

minimum impact on the benthic environment (Figure 8.7; also Kogan *et al.*, 2006).

Marine spatial planning

As our presence continues to grow offshore, governmental and non-governmental agencies seek to regulate this expansion through marine spatial planning (MSP) (Douvere and Ehler, 2008). In essence, MSP is a public process that aims to better organize human activities in marine areas to ultimately achieve ecological, economic and social objectives in an open and planned manner (Douvere and Ehler, 2009). Outside waters of national jurisdiction, however, there is no consensus on how such a system might work and what national or international legal regimes and institutions would be required for governance.

Two of several recurring themes for the establishment of successful MSP regimes are the need for good scientific information and the involvement of stakeholders. The exchange of information, mutual education and cooperation are essential for effective sharing of the seabed.

CONCLUDING COMMENTS

The submarine telecommunications network is an integral part of modern society. Since its establishment in the telegraph era, the network has extended around the planet. Historically, the highest communications traffic was between developed nations. However, that has changed. The network has rapidly expanded to connect most nations. East

African nations, for instance, are served by at least two major cable systems with more to follow within a year (e.g. EASSY, 2009; SEACOM, 2009). Southeast Asia is now a major telecommunications hub with the larger nations having substantial holdings in global cable companies. India is also a major cable owner and enjoys a high degree of connectivity, which in part reflects its position as a key centre for outsourcing services (Bardhan and Kroll, 2003).

The development of the fibre-optic highway as part of the world's *critical infrastructure* (Lacroix *et al.*, 2002) comes at a time of heightened awareness of the increasing pressures faced by the ocean. As outlined in this report, the weight of evidence shows that the environmental impact of fibre-optic cables is neutral to minor. In the deep ocean (more than c.1,000–1,500 m depth), which encompasses over 80 per cent of cable routes, any effect is limited to the placement of a non-toxic, 17–20 mm diameter tube on the ocean floor. The seabed may be disturbed periodically for repairs, but disturbance is localized and infrequent, as deep-ocean repairs account for less than 15 per cent of all cable faults (Kordahi and Shapiro, 2004). In the coastal ocean (less than c.1,000–1,500 m depth), fault repairs resulting from damage caused by fishing and anchoring, plus the need to bury cables for protection, disturb the seabed. However, studies cited in this report, including the OSPAR (2008) review on submarine *power* cables, conclude that disturbance is temporary, localized and infrequent.

As marine research continues to grow, it is highlighting hitherto poorly known benthic communities as well as discovering new ones. A prime example is cold-water coral communities, whose distribution, faunal composition and potential function have only recently come to light. By integrating such knowledge with that expressed in *Submarine Cables and the Oceans – Connecting the World*, the foundation is laid for a balanced approach to ocean use, its conservation and protection.

Glossary

Archipelago and archipelagic waters – an archipelago is a group of islands, including parts of islands, interconnecting waters and other natural features, which are so closely interrelated that they form a geographical, economic and political entity. In general terms, the associated archipelagic waters are those enclosed by a series of baselines that join the outermost points of the outermost islands in an archipelago. Such baselines are more specifically described under UNCLOS.

Armour – normally galvanized steel wires (of circular cross-section) laid around the core of the cable to provide both tensile strength and protection from external damage.

Atlantic Multidecadal Oscillation – a 20–40 year natural variability in the temperature of the North Atlantic Ocean surface, which may affect the formation of hurricanes.

Benthic community – an association of organisms living on, under or close to the ocean floor.

Bight – a U-shaped loop of cable or rope. Often refers to the single U-shaped loop of cable payed out from a cable ship as a final splice, or to the U-shaped loop of cable exiting the cable tank in which a repeater is positioned.

Biomass – the total mass of living material in a sample, population or specific area.

Biota – a collective term for the types of animals and plants present in a specific area or region at a given time.

Bottom otter trawl – a cone-shaped net attached by trawl lines to a fishing vessel and dragged across the ocean floor.

Branching unit (BU) – a sub-sea unit used at the point where a fibre-optic cable system splits into two legs, i.e. the fibres are split and may go to two terminals or to other branching units. Some branching units have the capability of switching the fibres from one leg to another.

Burial assessment survey (BAS) – a survey of the seabed to determine the likely success of any type of burial operation and to assist in the appropriate selection of cable armouring. Different combinations of tools may be used to constitute a BAS. For instance, it may be invasive and continuous, such as a mini-plough or grapnel-shaped tool. Alternatively, sampling can be carried out at discrete sites using techniques such as cone penetrometer tests (CPTs), or by sediment coring. Geophysical methods, such as resistivity or seismic reflection, can be used, or any combination of the above.

Cable network – a regional to global grouping of interconnected submarine cables, including repeaters and landing stations. A network provides redundancy in the event of a cable failure, in which instance voice and data traffic can be re-routed via intact parts of the network.

Cable protection zone – a defined area, usually identified on official marine charts, where submarine cables are afforded legal protection supported by various policing measures. Cable protection zones extending beyond territorial seas, normally 12 nautical miles, are generally not recognized under international law.

Cable route survey – a marine survey operation to obtain all the necessary information to design and engineer a cost-effective and reliable submarine cable system. Following receipt of the survey report, the installation cable route is optimized on the basis of data obtained on the seabed bathymetry (depth contours etc.), character, sediment thickness, marine life and other useful information such as currents, temperatures and prevailing weather conditions. The survey determines whether cable burial is required or indeed possible. A cable route survey is a prerequisite to laying a submarine cable and is integral to the freedom to lay and maintain international submarine cables under UNCLOS.

Cable vessel (also cable ship) – a vessel purpose-built or modified to lay and repair submarine cables. When engaged in such operations, the cable vessel displays special insignia or 'shapes' and navigation lights to alert other vessels to its restricted manoeuvrability as required by international law.

Census of Marine Life (COML) – a global network of researchers, representing more than 80 nations, engaged in a 10-year assessment and interpretation of the diversity, distribution and abundance of life in the oceans. The world's first comprehensive census is scheduled for release in 2010.

Climate change – a change in the state of the climate that can be identified by changes in the mean and/or variability of climatic properties (e.g. temperature, rainfall, wind) that persist for decades or longer.

Cold-water corals – a group of benthic anthozoans, commonly with a skeleton of calcium carbonate, which exist as individuals or form colonies. Unlike tropical corals, cold-water corals have no light-dependent algae and inhabit water depths to over 1,000 m in water temperatures of 4–13°C.

Component failure – whereby a constituent part of a cable fails and produces a fault. Failures of this type account for c.7 per cent of all cable faults.

Continental shelf – a zone, adjacent to a continent or island, which extends from the coast as a gently sloping plain (c.0.1°) to the shelf edge, where the seabed steepens to form the continental slope. The average depth of the shelf edge is c.135 m. The precise limits of a nation's legal continental shelf boundary claim beyond the EEZ are determined in accordance with criteria set forth in UNCLOS, but in no case shall extend beyond 350 nautical miles from the coastal state's coastal baseline.

Continental slope – a zone of relatively steep seabed (c.3-6°), extending from the shelf edge to the deep ocean. The slope is often incised by submarine canyons and/or landslides.

Convention on Biological Diversity – a convention established in 1993 to conserve biological biodiversity, to ensure the sustainable use of its components, and to share the benefits arising from utilization of genetic resources.

Deep-ocean trench – a long, narrow, steep-sided depression of the ocean floor that includes the deepest parts of the ocean.

Desktop study – a review of published and unpublished information which, in the context of submarine cables, provides an initial assessment of engineering, environmental and legal factors relating to a cable route.

El Niño-Southern Oscillation (ENSO) – describes regional changes in the atmosphere and ocean in the equatorial Pacific that occur on a c.3–7 year cycle.

Environmental impact assessment (EIA) – an evaluation of the potential environmental implications of laying and maintaining a submarine cable. An EIA may be required as part of the permission process for cable installation.

Epifauna – animals that live on surfaces such as the seabed, other organisms and objects including cables.

Epiflora – plants that reside on a surface such as the seabed, other organisms and objects including cables.

Exclusive economic zone (EEZ) – an area beyond and adjacent to the territorial sea that is subject to the specific legal regime established under UNCLOS. The EEZ extends to a maximum of 200 nautical miles from a coastal state's coastal baseline.

External human aggression fault – a cable fault caused by an external force, in this case by human activities such as fishing, anchoring, dredging, drilling etc.

External natural aggression fault – a cable fault caused by external natural forces such as submarine landslides and turbidity currents triggered by earthquakes.

Fish aggregating device (FAD) – various types of artificial float, either drifting or anchored to the seabed, designed to attract pelagic (mid-water-dwelling) fish including tuna and marlin.

Gas hydrate – an ice-like solid formed from a mixture of water and natural gas, usually methane, found in marine sediments. Hydrates are a potential source of hydrocarbon-based energy.

Global positioning system (GPS) – a global navigation system designed to provide accurate positional and navigational information derived from a constellation of 24 to 32 satellites.

Grapnel – a specialized hooked device used to recover submarine cables for repair or removal. Smaller grapnels are used by some fishermen to recover lost fishing gear.

Gutta percha – a natural gum from trees found on the Malay Peninsula and elsewhere; used to insulate submarine cables until the 1930s, when it was replaced by more durable plastics.

High seas – open ocean that is not within the territorial waters or jurisdiction of any particular state. The high seas are open to all states, whether coastal or land-locked. Freedoms of the high seas are exercised under the conditions laid down by UNCLOS and other rules of international law.

Hydrography – the science of measurement of physical aspects of Earth's surface waters, including water properties, flow and boundaries.

Hydrothermal vents – include fissures and fractures from which hot, often mineral-rich waters are expelled, especially along mid-ocean ridges and hotspots. Waters can reach +350°C, but rapidly cool in the cold ocean, forcing the precipitation of minerals.

Intergovernmental Panel on Climate Change – a science-based panel, set up in 1988 by the World Meteorological Organization and the United Nations Environment Programme, to evaluate the effects and risks of human-influenced climate change.

Internal waves – gravity waves that oscillate within a medium, in contrast to waves that form on the ocean surface. Internal waves may propagate along zones of marked density contrast in the ocean without disturbing the sea surface.

International Tribunal for the Law of the Sea (ITLOS) – an independent judicial body, located in Hamburg, Federal Republic of Germany, established under UNCLOS, to

adjudicate disputes arising out of the interpretation and application of the Convention.

Marine protected area – a formally designated area of open or coastal ocean whose natural and cultural resources are protected and managed by legal or other effective means.

Mid-ocean ridges – continuous mountain ranges that have formed along the central reaches of the main oceans. They mark the zones where tectonic plates drift apart to allow magma to upwell and form new volcanic crust/seafloor.

Multibeam systems – a ship-based or towed acoustic mapping system that allows swaths of seabed, up to tens of kilometres wide depending on water depth, to be accurately mapped during a single survey run.

Natural hazard – a naturally occurring physical phenomenon caused by rapid- or slow-onset events under the influence of atmospheric, oceanic or geological forces operating on time scales of hours to millennia.

Notice to mariners – published notifications that advise of changes in navigational aids, new hazards such as shipwrecks, new offshore installations, changes in water depth, submarine cable locations and operations, and other matters. This procedure allows for the constant updating of navigational charts.

Ocean observatories – semi-permanent or permanent observation sites in the ocean, designed to monitor a wide range of environmental parameters. Observatories have many configurations depending on the type of experiments and monitoring to be conducted. The data generated may be recovered by ships, satellite or, in the latest observatories, via submarine fibre-optic cable for transmission to shore-based facilities.

Optical amplifier – uses special fibres and a laser pump to amplify an optical signal. This is done without the optical signal being regenerated by conversion to an electrical signal and converted back into an optical signal (as is the case with optical regenerators). Submarine optical amplifiers are packaged in housings in a manner similar to repeaters and continue to be referred to as repeaters.

Optical fault – a fault caused by damage to the glass optical fibres in a submarine cable.

Otterboards – (also called trawl doors) typically heavy rectangular, oval or curved plates of metal or wood connected by the trawl lines to a fishing vessel and designed to keep the mouth of the net open.

Plough burial – burial of the cable into the seabed for enhanced cable protection. The cable is guided into a self-closing furrow cut by a sea plough towed by a cable ship.

Post-lay inspection (PLI) – an inspection conducted after deployment of a cable on or into the seabed to ensure correct placement and to monitor any subsequent environmental effects.

Post-lay inspection and burial (PLIB) – an operation usually carried out by an ROV in areas of plough burial after the cable installation. The inspection operation confirms the burial depth. If necessary, additional burial (usually by jetting) can be implemented in localized areas, e.g. at 'plough skips' where the plough has been recovered for repair or maintenance.

Remotely operated vehicle (ROV) – an unmanned submersible vehicle used to inspect, bury or exhume cables. They can also be used, *inter alia*, to carry out surveys and inspection of the cable on the seabed. ROVs are usually fitted with cameras and cable tracking equipment, and for burial operations can be fitted with jetting or trenching tools. ROVs are controlled from surface vessels and operate mainly in waters shallower than c.2,000 m.

Renewable energy farms – an integrated suite of devices that generate energy from ocean winds, waves, currents or tides and transfer the electricity to shore via submarine power cables.

Repeater – a submerged housing containing equipment that boosts the telecommunications signal at regular intervals along the cable (Figure 2.5). Each repeater is powered via an electrical current that is fed into the submarine cable system from the shore-based terminal stations. All telecommunications signals lose strength in proportion to the distance travelled, which explains why repeaters are only required on the longer submarine cable routes. The term 'repeater' originated in the telegraph era and has continued in use as a generic term to describe the submerged signal-boosting equipment that has been required in all of the longer submarine cable systems, regardless of the transmission technology used. In a modern fibre-optic submarine cable system, the repeater spacing is typically 70 km.

Sand waves – a condition where the seabed is covered by sand waves whose movement may expose previously buried cable.

Seamount – submarine elevation with the form of a mountain whose size differentiates it from small elevations such as pinnacles, banks and knolls.

Sea plough – see *Plough burial*

Sediment, marine – solid fragmental material, ranging in size from clay particles to boulders, derived from terrestrial or marine sources and distributed by water, wind or ice.

Seismic profiler – see *Sub-bottom profiler*

Shunt fault – occurs when a cable's insulation is damaged

or degraded. This exposes the copper conductor carrying electrical current, which passes or 'shorts' into the ocean.

Side-scan sonar – an acoustic technique to map the reflectivity of seabed material to identify potential obstructions on the seabed. Used primarily during surveys prior to ploughing operations. The use of side-scan sonar is helpful in cable repair operations in identifying surface-laid cables and in localizing fault locations.

Strumming – a term used to describe the standing wave vibration set up in unsupported cable during deployment or when in suspension between localized high sectors on the seabed. Strumming is induced by the drag forces generated when water currents flow across the cable in suspension.

Sub-bottom profiler (SBP) – an acoustic method of determining the vertical geological structure of the upper seabed. SBP equipment releases low-power, high-frequency, short pulses of acoustic energy into the water column and measures energy reflected back from the seabed and from layers below the seabed, revealing the differing physical properties of those layers. For cables, this information helps define potential hazards and the availability of sediment suitable for cable burial.

Submarine canyon – a narrow, steep-sided, V-shaped depression, typically incised into the continental shelf and slope.

Submarine channel – a shallow to steep-sided depression that may be fed by one or more submarine canyons. Compared to canyons, channels usually have V- to U-shaped profiles, are often bordered by well-developed levee systems, are longer and extend to greater ocean depths.

Submarine coaxial cable – a telephonic communications system comprising inner and outer copper conductors separated by a polyethylene insulator. This design replaced telegraphic cables in the 1950s, and was later replaced by fibre-optic designs.

Submarine fibre-optic cable – a communications system in which digitized data and voice signals are converted to coded light pulses and transmitted along optical glass fibres. Fibre-optic cables replaced coaxial cables in the 1980s.

Submarine landslides – a general term that encompasses mainly gravity-driven, downward and outward movements of sediment and rock. They frequently occur on, but are not confined to, continental slopes, especially those in seismically active regions.

Submarine telegraphic cable – an earlier communications system in which coded electrical impulses were transmitted through an insulated copper wire conductor.

Submarine telephone cable – see *Submarine coaxial cable*

Suspension – a term used to describe an unsupported length of cable held in a catenary by the residual cable tension at each side of the suspension. Suspended cables can suffer damage at the contact points where abrasion (chafe) can occur and may be subject to strumming.

Tectonic plate – a large, relatively rigid segment of the Earth's crust and upper mantle that moves horizontally and interacts with other plates to produce seismic, volcanic and tectonic activity.

Territorial sea – refers to a state's coastal waters, which extend out to 12 nautical miles from a baseline commonly defined by the mean low water mark. Territorial sea limits and permitted activities in territorial seas are determined in accordance with UNCLOS and international law.

Thermohaline circulation – a world-wide, interconnected system of currents, which are driven mainly by density differences associated with atmospheric cooling or heating of the ocean and the addition or loss of fresh water. Winds also play a prominent role in driving the circulation.

Tsunami – waves of great wavelength, usually generated by earthquakes or submarine landslides; not to be confused with 'tidal waves', which result from astronomical forces on the ocean.

Turbidity current – a dense, sediment-laden current that flows rapidly across the ocean floor, often via submarine canyons and channels. Turbidity currents can be triggered by earthquakes, storms and river floods, and are capable of breaking submarine cables.

United Nations Convention on the Law of the Sea (UNCLOS), 1982 – a convention known as the 'constitution of the world's oceans' that entered into force in 1994. UNCLOS establishes a legal framework to govern all ocean space, its uses and resources. It contains provisions relating to the territorial sea, the contiguous zone, the legal continental shelf, the exclusive economic zone and the high seas. UNCLOS defines freedoms and responsibilities for international submarine cables, navigation and other activities within these zones. It also provides for environmental protection and preservation, marine scientific research, and the development and transfer of marine technology.

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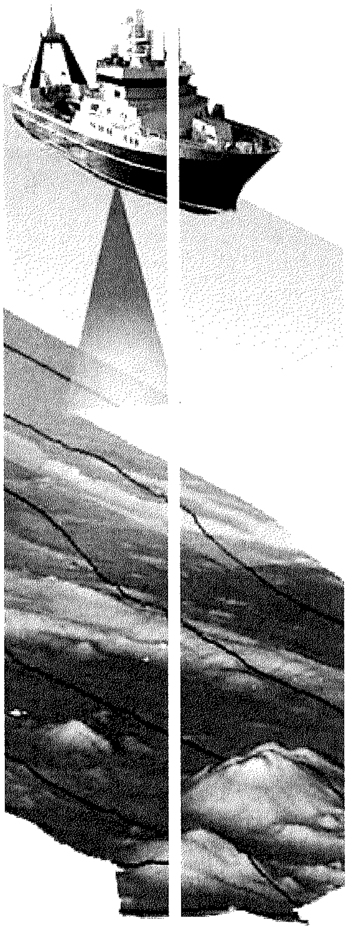

Submarine cables and the oceans: connecting the world

The first submarine cable – a copper-based telegraph cable – was laid across the Channel between the United Kingdom and France in 1850. Since then, submarine cables have literally connected the world. Now, when clicking the 'Send' button on an intercontinental email, it will almost certainly travel via the global network of submarine fibre-optic cables. The establishment of this network over the past two decades, together with the rapid rise of the internet, has revolutionized communications. The significance of that revolution was underscored in 2009 when the pioneer of fibre-optic communications, Professor Charles K. Kao, shared the Nobel Prize for Physics. Today, financial markets, general commerce, education, entertainment or just a simple telephone call are almost totally dependent on the submarine cable network whenever a trans-oceanic connection is required.

The last 20 years have also witnessed a greater human presence in coastal seas and oceans as a growing population seeks more space and resources. Coastal seas in Europe now accommodate wind turbine farms as nations develop clean and secure supplies of renewable energy. Large areas of the deep Pacific and Indian oceans have been marked for future mineral exploration. Even traditional uses of the oceans, such as fishing and shipping, are changing. The number and size of merchant ships have increased, in part to service the rapidly expanding economies of China and India. Aquaculture now accounts for 50 per cent of the fish for human consumption, with the remainder coming from traditional wild fisheries. This ever-increasing human presence offshore has not gone unnoticed. Governments and other organizations are seeking to conserve and protect the marine environment, while mindful that such measures need to be balanced with responsible development in order to meet human needs.

In that context, *Submarine Cables and the Oceans – Connecting the World* is a timely account of an historic use of the oceans, namely as a seabed platform for the submarine telecommunications cable network. This report covers the history and nature of cables, their special status in international law, their interaction with the environment and other ocean users and, finally, the challenges of the future. It is an evidence-based synopsis that aims to improve the quality and availability of information to enhance understanding and cooperation between all stakeholders.

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December 2009 RS No. 188

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Fibre Optic Project – Additional information

Jan 8, 2019

1 How many households will benefit from the deployment of fibre optic to their community

	Private Dwellings populated by usual residents	Private Dwellings
Cape Dorset -	366	415
Kimmirut	114	139
Sanikiluaq	218	231
Iqaluit	2499	3076
Total	3197	3861

Private dwellings occupied by usual residents
'Private dwelling occupied by usual residents' refers to a private dwelling in which a person or a group of persons is permanently residing. Also included are private dwellings whose usual residents are temporarily absent on May 10, 2016.

2 How many households will benefit from reduced competition for satellite-delivered bandwidth.

	Private Dwellings populated by usual residents	Private Dwellings
Nunavut excluding communities connecting to fibre	6640	7572

- Total impact of installation of fibre – in those communities where the fibre optic cable is connecting, it is expected that there will be the potential for local IP providers to deliver residential and commercial internet connectivity exceeding the CRTC target of 50/10.
- Further in those communities that are not directly impacted by the fibre optic cable installation, the reduced competition for available bandwidth provided by satellite will provide significant improvements.

Note: This project will provide the backbone. IP providers will be responsible for providing the internet service to the individual customers.

3. [redacted]

[redacted]

4 What percentage overall is the design?

Considering that the project is generally at the planning stage, the consultants estimate that at the moment, the design over all for the project is approximately 25% complete.

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ATIA - 21(1)(b)

McCallum, Robert (INFC)

From: McCallum, Robert (INFC)
Sent: March 27, 2019 1:53 PM
To: Brown, Tim; Robbins, Laura (INFC)
Cc: Casson, Linda; INFC|INFC (andrew.antinucci@canada.ca); Djordjevic, Ana (INFC)
Subject: RE: ICIP approvals

Hi Tim

I discussed this with Laura, and noted your reference to the state of funding in the table we received a few minutes ago.

We expect that confirmation of $30 mi[redacted] support the requirement for recipient contribution.[redacted] Meanwhile, please keep us in the loop as your anticipated timing and other details on the approval of the last $5 million evolve.

Rob

From: Brown, Tim [mailto:Tim.Brown@GOV.NU.CA]
Sent: March 26, 2019 1:14 PM
To: Robbins, Laura (INFC) ; McCallum, Robert (INFC)
Cc: Casson, Linda
Subject: FW: ICIP approvals

Hi Laura/Robert,

Do we need to confirm/demonstrate the appropriation of Vote 2 GN contribution for projects as a requirement of project approval by[redacted]
How long can we delay this confirmation?

We understand there is a check box asking for confirming matching contribution, but we are wondering what our margin of movement is for getting the additional funding we require for the fibre project approved.

[redacted]

Thanks,

Tim

Tim Brown
Director
Community Support and Infrastructure
Community and Government Services
(867) 975-5463

ATIA - 16(2)
ATIA - 19(1)

McCallum, Robert (INFC)

From: Barry Reimer [redacted]>
Sent: March 29, 2019 3:03 PM
To: McCallum, Robert (INFC); 'Casson, Linda'; Djordjevic, Ana (INFC); Antinucci, Andrew (INFC); 'Brown, Tim'
Subject: RE: NU Fibre Discussion

Importance: High

We can use this number – I am the host:

Dial In: 1 (866) 969 8429 Conference ID [redacted]

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: March 29, 2019 11:57 AM
To: Casson, Linda <LCasson@GOV.NU.CA>; Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>; Barry Reimer [redacted]
Subject: RE: NU Fibre Discussion

I thought you were going to provide a line this time?

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: March 29, 2019 2:56 PM
To: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>; Barry Reimer [redacted]
Subject: RE: NU Fibre Discussion

Joining information?

-----Original Appointment-----
From: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>
Sent: March 29, 2019 9:25 AM
To: Djordjevic, Ana (INFC); McCallum, Robert (INFC); Antinucci, Andrew (INFC); Casson, Linda; Brown, Tim; Barry Reimer
Subject: NU Fibre Discussion
When: March 29, 2019 3:00 PM-4:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: INFC CONF VC Ott-180Kent-09-116 VC CONF INFC

Discussion to follow-up on pressing issues regarding the Undersea Fibre Optic Cable Installation Linking Greenland, Nunavut and Quebec.

Call-in Information: To follow

Antinucci, Andrew (INFC)

From: Barry Reimer [redacted]
Sent: March 30, 2019 12:55 PM
To: Djordjevic, Ana (INFC); McCallum, Robert (INFC); Antinucci, Andrew (INFC)
Cc: 'Casson, Linda'; 'Brown, Tim'
Subject: RE: NU Fibre Project - Glossary of Terms
Attachments: Glossary of Terms.pdf

Just forwarding this glossary of terms as discussed on our call yesterday...

Barry

-----Original Appointment-----
From: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>
Sent: March 29, 2019 6:25 AM
To: Djordjevic, Ana (INFC); McCallum, Robert (INFC); Antinucci, Andrew (INFC); Casson, Linda; Brown, Tim; Barry Reimer
Subject: NU Fibre Discussion
When: March 29, 2019 3:00 PM-4:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: INFC CONF VC Ott-180Kent-09-116 VC CONF INFC

Discussion to follow-up on pressing issues regarding the Undersea Fibre Optic Cable Installation Linking Greenland, Nunavut and Quebec.

Call-in Information: To follow

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ATIA - 19(1)

ATIA - 21(1)(b)

McCallum, Robert (INFC)

From:	Casson, Linda <LCasson@GOV.NU.CA>
Sent:	April 4, 2019 3:17 PM
To:	McCallum, Robert (INFC)
Cc:	Djordjevic, Ana (INFC); Antinucci, Andrew (INFC); Barry Reimer
Subject:	FW: Updated Business Case Document for INFC
Attachments:	GN Fibre Business Case - April 2019 Update_20190404.pdf

Good day, Robert

Attached is the revised business case for the fibre project.

We look forward to your comments and providing any further information you may need [redacted]

Best regards

Qujannamiik/Merci/Thank You

Linda Casson

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Manager, Infrastructure Programs
Department of Community and Government Services
Government of Nunavut

Atanguyaq, Nunalaaniituni Tunngavikhaliqiyunut
Nunalingni Kavamatkunnilu Pivikhaqautikkut
Nunavut Kavamanga

Gestionnaire, programmes d'Infrastructure
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Gouvernement du Nunavut

☎ 867-975-5336

✉ lcasson@gov.nu.ca

Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: Barry Reimer [redacted]
Sent: April 4, 2019 2:56 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: Devereaux, Eiryn <EDevereaux@GOV.NU.CA>; Seeley, Kyle <KSeeley@gov.nu.ca>; Mulak, Paul <PMulak@GOV.NU.CA>; Brown, Tim <Tim.Brown@GOV.NU.CA>; Hickey, Ted <Ted.Hickey@gov.nu.ca>; Pudluk, Juanie <JPudluk@GOV.NU.CA>; Wells, Dean <Dean.Wells@gov.nu.ca>
Subject: RE: Updated Business Case Document for INFC

And a pdf version...

From: Barry Reimer [redacted]
Sent: April 4, 2019 11:55 AM

ATIA - 21(1)(b) ATIA - 14

ATIA - 19(1)

To: 'Casson, Linda' <LCasson@GOV.NU.CA>
Cc: 'Devereaux, Eiryn' <EDevereaux@GOV.NU.CA>; 'Seeley, Kyle' <KSeeley@gov.nu.ca>; 'Mulak, Paul' <PMulak@GOV.NU.CA>; 'Brown, Tim' <Tim.Brown@GOV.NU.CA>; 'Hickey, Ted' <Ted.Hickey@gov.nu.ca>; 'Pudluk, Juanie' <JPudluk@GOV.NU.CA>; 'Wells, Dean' <Dean.Wells@gov.nu.ca>
Subject: Updated Business Case Document for INFC

Hi Linda,

I have created and attached the updated business case document to send to INFC. This update addresses the suggestions from yourself and Ted yesterday, and includes t[redacted]s per my email last night.

I am not sure if the Attestation page at the needs to be signed before sending, but I will leave that part to you. I will send a pdf copy via separate email due to size limitations. Please let me know if you have any more questions before you send.

Thanks!
Barry

Barry Reime[redacted]
ᐱᐅᓇ ᕆᒧ
Project Director, Katittuq Nunavut
(Greenland-Nunavut Undersea Fibre Project)
M: [redacted]

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ATIA - 16(2)

McCallum, Robert (INFC)

From: McCallum, Robert (INFC)
Sent: April 17, 2019 9:26 AM
To: Antinucci, Andrew (INFC); Trottier-Abbott, Catherine (INFC); Casson, Linda; Brown, Tim
Cc: Barry Reimer
Subject: RE: NU Fibre Project Discussion

Hi all

We'd like to go ahead with this call at 10, as we have a number of questions that have come up. Note that Ana is no longer on the file – it's me and Andrew going forward. The conference dial-in info as per below should still work.

Rob

-----Original Appointment-----
From: Djordjevic, Ana (INFC)
Sent: February 20, 2019 1:56 PM
To: Djordjevic, Ana (INFC); Antinucci, Andrew (INFC); McCallum, Robert (INFC); Trottier-Abbott, Catherine (INFC); Casson, Linda; Brown, Tim
Cc: Barry Reimer
Subject: NU Fibre Project Discussion
When: April 17, 2019 10:00 AM-11:00 AM (UTC-05:00) Eastern Time (US & Canada).
Where: INFC CONF Ott-180Kent-09-001 CONF INFC

Bi-weekly (for now) discussion to follow-up on pressing issues regarding the Undersea Fibre Optic Cable Installation Linking Greenland, Nunavut and Quebec (NU ICIP) project.

Call in information:

Local call-in number: 613-960-7610
Toll-free call-in number: 1-877-413-4781
Conference code[redacted]

ATIA - 21(1)(b

McCallum, Robert (INFC)

From: McCallum, Robert (INFC)
Sent: April 17, 2019 10:48 AM
To: Linda Casson; Tim Brown
Subject: Arrange a call

Hi Linda and Tim

Seems to have been some confusion over whether we were having the call this morning [redacted] Could we talk – we have lots of questions. Perhaps tomorrow morning?

Robert G. McCallum, P.Eng.
(613) 948-9450
robert.mccallum@canada.ca

McCallum, Robert (INFC)

From: McCallum, Robert (INFC)
Sent: April 24, 2019 12:07 AM
To: Brown, Tim
Cc: Casson, Linda; Barry Reimer; Andrew Antinucci
Subject: RE: Call with INFC?

We did not settle on a time, but let's target 2 pm Wednesday as you suggest. I'll send out contact info in the morning. I managed to consolidate the questions tonight, and will read them over one more time in the morning, with fresh eyes, and send them out then.

Rob

From: Brown, Tim [mailto:Tim.Brown@GOV.NU.CA]
Sent: April 23, 2019 5:39 PM
To: McCallum, Robert (INFC)
Cc: Casson, Linda ; Barry Reimer
Subject: FW: Call with INFC?

Hi Robert,

Hope you had a good long weekend away from the office! I am just getting back into the swing of things and looking at my calendar, and I can't recall if we set a time for a make up meeting for the one we missed last week.

We talked about you getting us a list of questions in writing so we could spend some time getting you proper answers. Is that still the plan? And are you still expecting a call tomorrow? If so, could we aim for 2 pm EST?

Thanks,

Tim

Tim Brown
Director
Community Support and Infrastructure
Community and Government Services
(867) 975-5463

McCallum, Robert (INFC)

From: McCallum, Robert (INFC)
Sent: April 24, 2019 12:58 PM
To: Linda Casson; Tim Brown; Barry Reimer
Cc: INFC|INFC (andrew.antinucci@canada.ca)
Subject: New Questions
Attachments: NU Fibre Project - Question-Response Table - 2019-04-24 INFC new questio....docx

See attached table. New questions are in red type. You won't have had time to react to these questions, so today we will explain the questions as required, and you can prepare responses over the next few days.

Robert G. McCallum, P.Eng.
(613) 948-9450
robert.mccallum@canada.ca

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ATIA - 19(1)

Antinucci, Andrew (INFC)

From:	Casson, Linda <LCasson@GOV.NU.CA>
Sent:	May 1, 2019 2:41 PM
To:	Antinucci, Andrew (INFC)
Subject:	FW: INFC Fibre Project Application - May 1 2019
Attachments:	INFC Fibre Project Application - May 1 2019.docx

Hi Andrew
I'll update the amount of design to 33% as per the table but I'm still not sure about the households question. I can insert the number of households that we refer to in the table, however, I would still like your guidance on how to step forward on that question.

Linda

From: Casson, Linda
Sent: May 1, 2019 2:07 PM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: INFC Fibre Project Application - May 1 2019

Hi Andrew
Here is a revised draft application form. I'm checking with Barry re degree of design complete as that seems to vary between documents. Also I'm not sure how to handle the number of households….I had sent a couple of tables with household numbers previously but [redacted] as to how to answer this one to meet the outcomes.

We have also requested an exemption from the GHG assessment because there is not much we can do about a single ship in the ocean but am not sure what additional rationale you need. I had already sent something,….i think.

From our other projects, I believe our project description is a bit long….do you want me to trim?

Thanks

Qujannamiik/Merci/Thank You

Linda Casson

☎ 867-975-5336

✉ lcasson@gov.nu.ca

Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

ICIP Project Application

1 Project Tombstone Information

Project Title	Project ID
Undersea Fibre Optic Cable Installation Linking Greenland and Nunavut	*577001*

Investment Stream

☒ Rural and Northern Communities

Project Description

The Government of Nunavut *Undersea Fibre Optic Cable Installation Linking Greenland and Nunavut* will construct a state-of-the-art submarine fiber optic system connecting Iqaluit and Kimmirut with Nuuk, Greenland. The Nuuk Greenland fibre optic system in turn connects internationally to Milton, Newfoundland and to points in Iceland which then connect with various points in Europe. The installation will include the capability to extend the fibre optic system in future phases of development to other Nunavut communities including Cape Dorset, communities on northern Baffin Island and western Hudson Bay, as well as a redundant connection to the Kativik Regional Government (KRG) system, planned for implementation starting in 2019. An additional component for future consideration would be a fibre optic cable branch from the KRG system to Sanikiluaq in the southern Hudson Bay.

Approximately 1,700 km of fibre optic cable will be installed in the first phase of the project between Kimmirut, Iqaluit and Nuuk, Greenland. This will include all submarine and cable landing infrastructure including the fibre optical cable, powered repeaters, submarine line terminating equipment, power-feed equipment, and system monitoring equipment.

Internet and local Service Providers in Nunavut will then have access to broadband connectivity for service distribution to their customers. The model for distribution/resale has yet to be defined.

The fibre backbone is expected to significantly reduce the cost of bandwidth relative to the current satellite service while dramatically improving the connectivity for the customer which currently averages between 3 Mbps and 15 Mbps. The GN's goal is to meet the Canadian Radio-television and Telecommunications Commission targets of 50 Mbps to all communities in 10 years.

Project Characteristics

Is the asset public facing?	NO
If yes, the highest published accessibility standard, code, or by-laws in the jurisdiction will be met or exceeded	N/A
The highest published applicable energy efficiency standard in the jurisdiction will be met or exceeded	N/A

ATIA - 13(1)(c)

ATIA - 14

This project includes housing; early learning and childcare facilities, highways and trade corridor infrastructure, resource development infrastructure, healthcare facilities or education facilities.	NO
This project advances reconciliation with Indigenous peoples	YES

Ultimate Recipient

Name	Government of Nunavut, Community and Government Services
Type	Territorial Government

Location

Province/Territory	Nunavut
Municipality	Iqaluit, Kimmirut

Note: A .KML file must be submitted separately with this application or it will be considered incomplete.

2 Project Finances

Sources of Funds

Are sources of funding secured for the total project costs?" *If no, provide explanation.*	The Gov't of Nunavut has secured $30 million and will be requesting the additional $5 million through the supplementary appropriate process.

Source	Amount ($)
Total Project Costs	[redacted]
Total Eligible Costs	[redacted]
Program Contribution – Stream 1 *(Rural and Northern Communities)*	[redacted]
Program Contribution – Stream 2 *(specify)*	[redacted]
Provincial or Territorial Contribution	[redacted]
Ultimate Recipient Contribution	

Fiscal Year Breakdown - INFC Share (April 1 to March 31)

2018-19		2023-24	
2019-20	[redacted]	2024-25	
2020-21	[redacted]	2025-26	
2021-22	[redacted]	2026-27	
2022-23		2027-28	

3 Project Implementation Details

Nature of the Project *(indicate % for each relevant type)*

100 %	New
%	Rehabilitation
%	Expansion
%	Other (provide explanation)

Asset Ownership

Will the Ultimate Recipient own and operate the asset?	YES
If No, provide additional information	

Percentage of design completed

☐ not started ☒ up to 25% ☐ 26-50% ☐ 51-75% ☐ 76-100%

Construction Dates (DD, Month, YYYY)

Forecasted Construction Start Date	30, July, 2020
Forecasted Construction End Date	31, March, 2022

Sole Source Contracting

Will a sole source procurement be used?	NO
Contract #1	*Detailed information for the contract, as per the Project Submission Guide*
Contract #2	*Detailed information for the contract (add more rows if necessary)*

4 Outcomes, Indicators and Targets

Project outcome

☒ Improved broadband connectivity

Indicators

	Before investment	After Investment
Number of households that have access to the highest broadband speed range in their jurisdiction		
Increase in available bandwidth in Iqaluit, Kimmirut	5 – 9.9 Mbps	
Increase in available bandwidth in remaining Nunavut communities	5 – 9.9	

Project type (Select all that apply)	Internet backbone connecting broadband to a community	

	Last mile connecting the broadband backbone to individual households	
	Other – providing the fiber optic backbone to a shoreline location and internet service providers will then distribute to the consumers.	Yes

5 Climate Lens *(as applicable)*

Have you included a **GHG mitigation assessment** with your project application?		NO – Nunavut will be requesting an exemption	
Have you included a **Climate resilience assessment** with your project application?		NO	
Expected lifespan of the asset*	30 years	Indicate the year in which the expected lifespan of the asset begins	2022
Confirm that the relevant attestation(s) has been completed by a qualified assessor or validator			Yes

**If the project involves multiple assets, please indicate the total lifespan for all assets assessed under the Climate Lens.*

GHG Mitigation Assessment

2030 GHG Results			**Lifetime GHG Results**		
Baseline scenario emissions, cumulative to 2030		0 t / kt / Mt	Baseline scenario emissions, lifetime		0t / kt / Mt
Estimated project emissions, cumulative to 2030		0t / kt / Mt	Estimated project emissions, lifetime		0t / kt / Mt
Net emissions	REDUCTION or INCREASE	t / kt / Mt	Net emissions	REDUCTION or INCREASE	t / kt / Mt

Climate Resilience Assessment

Have risks associated with climate change and extreme weather events in the design, location and planned operation of the project been considered? *Note, these risks could be rapid (e.g. a heavy rainfall) or gradual (sea-level rise) and present or anticipated threats associated with climate change.*	yes

What hazards, associated with climate change and extreme weather events, were identified which may impact the project's integrity and its ability to provide sustained service through its design life? *Select all that apply.*

x	Storm surges		Increased frequency of freeze-thaw cycles
	Higher tides		Increased rainfall
x	Sea level rise		Increased overland flooding
	Coastal erosion		Increased snow loads
	Salt water intrusion		Increased wind speeds or tornadoes
	Heat waves or heat island effect		Hurricanes

	Permafrost degradation		Hail
	Drought		Windstorms
	Wildland fires		Ice storms
	Other *(specify)*		Other *(specify)*

Describe key measures or features of the project that incorporate climate change considerations.	Impact of climate change will be incorporated into the planning for the landing sites.

6 Community employment benefits reporting *(as applicable)*

Does the project include community employment benefits? If yes, provide additional information on targeted groups and % hours worked or value of contracts below. If no, provide rationale.			No
Rationale for not including community employment benefits as part of the project.	The workforce involved with the building and laying of undersea fibre optic cable are highly specialized. Inuit hire will be determined through the NNI process and is expected to be measurable for the building of the landing sites.		
		Will the target group benefit?	**% hours worked**
Which specific groups will you be targeting for employment opportunities on this project? *Provide the % of total project hours that you anticipate each targeted group will work.*	Apprentices	UNKNOWN	%
	Indigenous peoples	YES	%
	Women	UNKNOWN	%
	Persons with disabilities	NO	%
	Veterans	UNKNOWN	%
	Youth	NO	%
	New Canadians	UNKNOWN	%
		Will the target group benefit?	**Total value of contract**
Which types of enterprises will you be targeting? *Provide the total value of contracts.*	Small enterprise	NO	$
	Medium enterprise	NO	
	Social enterprise	NO	

7 Risks and Mitigation Strategies

Project Complexity *(select all that apply)*	**Description and Mitigation Strategies**

☒ Remote Geographical location ☒ Unpredictable weather ☐ Innovative Project/Technologies ☐ Technical nature of the project ☐ Interdependencies between phases ☒ Other (describe) ☐ No risk identified	*The Arctic waters weather window is fairly short and sea ice condition may be unpredictable. This risk has been considered in the contingency.* *The result of the marine survey will confirm the sea bed conditions which will determine the degree of ice scouring, the type of shielding that will be required.*
Project Readiness *(select all that apply)*	**Description and Mitigation Strategies**
☒ Project site selection hasn't been finalized ☒ Land hasn't been acquired ☐ Potential issues with permits or authorizations (federal, provincial, territorial and municipal) ☐ Industry supply may not be able to meet demand ☐ Non-federal sources of funding are not secured for the entire project cost ☐ Other (describe) ☐ No risk identified	*Site selection is done and climate change and mitigation factors have been considered* *Municipal – Landing sites are on Commissioners land and GN is responsible to survey the sites. No issues have been identified.* *Landing in Greenland. Investigating a number of options, lease, negotiating with Telegreenland.*
Public Sensitivity *(select all that apply)*	**Description and Mitigation Strategies**
☒ The project has received positive media attention ☐ The project has received negative media attention ☒ Certain stakeholders have been vocal about the project ☐ Other (describe) ☐ No risk identified	*The people of Nunavut have been vocal about the need for expanded broadband* *Residents, businesses and government are very positive in favour of this project.*
Ultimate Recipient Risk *(select all that apply)*	**Description and Mitigation Strategies**
☐ The Ultimate Recipient does not have experience with this type of project ☒ The Ultimate Recipient has low capacity in one or more area: technical expertise, human resources, reporting, delivery of past projects, etc. ☐ Other (describe) ☐ No risk identified	The Government of Nunavut will require expertise, project management and additional human resources to be able to successfully deliver this project. Resources have been hired for program management and technical consulting

8 Attestation (by the Province or Territory)

I, Tim Brown, Director, Community Infrastructure, Community and Government Services with Government of Nunavut, attest that:

1. The information provided in this project application is complete and accurate.

2. Federal funding will support only Eligible Expenditures and that the project meets the provisions as specified in the ICIP Bilateral Agreement.

3. The project will be governed under the terms of the ICIP Bilateral Agreement.

Dated, this 1^{th} day of November, 2018

____

Signature

McCallum, Robert (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: May 1, 2019 3:34 PM
To: Antinucci, Andrew (INFC)
Cc: McCallum, Robert (INFC)
Subject: RE: INFC Fibre Project Application - May 1 2019

Perfect, to me, this seemed very justifiable because of the increase in bandwidth across the territory. I will use these numbers to insert in the application form. Do you want this application re-attested?

Cheers

Linda

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: May 1, 2019 2:50 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: RE: INFC Fibre Project Application - May 1 2019

Sorry – just saw your recent email and the attachments dropped. Resending anyways...

I think we are aligned on the design percentage, however regarding the number of households connected, let me know if this makes sense.

Andrew

From: Antinucci, Andrew (INFC)
Sent: May 1, 2019 2:48 PM
To: 'Casson, Linda' <LCasson@GOV.NU.CA>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: RE: INFC Fibre Project Application - May 1 2019

Hi Linda,

Thanks for this – it is much appreciated.

Regarding the percentage related to design completed to date: based on your response to the table (attached) back in March, GN indicated that 33% of design was completed, especially as that level of design yielded a Class C cost estimate.

Regarding the number of households: the best way to identify this is the number of households that can potentially benefit from the internet emanating from fibre cables. Back in March, you provided breakdowns on number of dwellings in both Iqaluit and Kimmirut that would benefit from the deployment of fibre in their communities.

Let me know if this is helpful – happy to chat further.

ATIA - 19(1)

Andrew

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: May 1, 2019 2:07 PM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: INFC Fibre Project Application - May 1 2019

Hi Andrew
Here is a revised draft application form. I'm checking with Barry re degree of design complete as that seems to vary between documents. Also I'm not sure how to handle the number of households….I had sent a couple of tables with household numbers previously but [redacted] as to how to answer this one to meet the outcomes.

We have also requested an exemption from the GHG assessment because there is not much we can do about a single ship in the ocean but am not sure what additional rationale you need. I had already sent something,….i think.

From our other projects, I believe our project description is a bit long….do you want me to trim?

Thanks

Qujannamiik/Merci/Thank You

Linda Casson

☎ 867-975-5336
✉ lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

Pages 310-324
are withheld
pursuant to paragraphs
13(1)(c), 14 & 21(1)(b)
of the *Access to Information Act*

****

Les pages 310-324
Font l'objet d'une exception totale
conformément aux dispositions des
paragraphes
13(1)(c), 14 & 21(1)(b)
de la *loi sur l'accès à l'information*

ATIA - 15(1)

ATIA - 21(1)(b)

Fibre Optic Project – Additional information

Jan 8, 2019

1 How many households will benefit from the deployment of fibre optic to their community

	Private Dwellings populated by usual residents	Private Dwellings
Cape Dorset -	366	415
Kimmirut	114	139
Sanikiluaq	218	231
Iqaluit	2499	3076
Total	3197	3861

Private dwellings occupied by usual residents
'Private dwelling occupied by usual residents' refers to a private dwelling in which a person or a group of persons is permanently residing. Also included are private dwellings whose usual residents are temporarily absent on May 10, 2016.

2 How many households will benefit from reduced competition for satellite-delivered bandwidth.

	Private Dwellings populated by usual residents	Private Dwellings
Nunavut excluding communities connecting to fibre	6640	7572

- Total impact of installation of fibre – in those communities where the fibre optic cable is connecting, it is expected that there will be the potential for local IP providers to deliver residential and commercial internet connectivity exceeding the CRTC target of 50/10.
- Further in those communities that are not directly impacted by the fibre optic cable installation, the reduced competition for available bandwidth provided by satellite will provide significant improvements.

Note: This project will provide the backbone. IP providers will be responsible for providing the internet service to the individual customers.

3. [redacted]

4 What percentage overall is the design?

Considering that the project is generally at the planning stage, the consultants estimate that at the moment, the design over all for the project is approximately 25% complete.

Antinucci, Andrew (INFC)

From:	Casson, Linda <LCasson@GOV.NU.CA>
Sent:	May 1, 2019 3:40 PM
To:	Antinucci, Andrew (INFC)
Subject:	INFC Fibre Project Application - May 1 2019 a
Attachments:	INFC Fibre Project Application - May 1 2019 a.docx

Hi Andrew
I updated the households based on the table.

Cheers

Linda

Government of Canada Gouvernement du Canada

Project Submission

Project ICIP - Undersea Fibre Optic Cable Installation Linking Greenland and Nunavut - Submitted

General

Agreement Recipient

Government of Nunavut

*** Project Title**

Undersea Fibre Optic Cable Installation Linking Greenland and Nunavut

*** Brief Project Description**

The Undersea Fibre Optic Cable Installation Project will construct a state-of-the-art submarine fibre optic system to connect Iqaluit and Kimmirut, Nunavut with Nuuk, Greenland. The Project will include the capability to extend the fibre optic system in the future to other Nunavut communities or northern Quebec. Approximately 1,700km of fibre optic cable and all submarine and cable landing infrastructure will be installed including powered repeaters, line terminating equipment, power-feeding equipment, and monitoring equipment.
The fibre backbone is expected to improve connectivity for the customer with a goal to meet the Canadian Radio-television and Telecommunications Commission targets of 50 Mbps in 10 years.

*** P/T Project Identifier**

577001

*** Investment Stream(s)**

Rural and Northern Communities

Project Characteristics

*** The highest published applicable energy efficiency standard in the jurisdiction will be met or exceeded.**

No

*** Is the asset public-facing?**

No

* **This project includes dedicated spacing for housing; early learning and childcare facilities, highways and trade corridor infrastructure, resource development infrastructure, healthcare facilities or education facilities.**

No

* **The project advances reconciliation with Indigenous communities.**

Yes

Ultimate Recipient (s)

* **Select from the list the Ultimate Recipient (s) for the project.**

Government of Nunavut

* **If the Ultimate Recipient is not in the list, enter the name below. You may enter more than one.**

Project Finances

*** Are sources of funding secured for the total project costs?**

No

*** Provide explanation**

The remaining $20.4M contribution from Nunavut will be submitted for approval in the 2019 fall sitting of the Legislative Assembly.

*** Total Project Costs**

$201,617,753.00

*** Total Eligible Costs**

$201,617,753.00

Provincial /Territorial Contribution

$50,404,438.00

*** Total Program Contribution**

$151,213,315.00 | 75 %

For each of the selected streams indicate the program contribution.

Investment Stream(s)	Contribution Amount
* Rural and Northern Communities	* $151,213,315.00

Ultimate Recipient Contribution

Name of Contributor	Contribution Amount

Other Contribution

Name of Contributor	Contribution Amount

ATIA - 13(1)(c)
ATIA - 14

Other Federal Contribution (such as Gas Tax)

Name of Contributor	Contribution Amount

Cash Flow

Please provide an estimate of when the total program contribution will be claimed by federal fiscal year (April 1st to March 31st).

Fiscal Year	Amount
* 2018-2019	* [redacted]
* 2019-2020	* [redacted]
* 2020-2021	* [redacted]
* 2021-2022	* [redacted]
* 2022-2023	* [redacted]
Total	**$151,213,315.00**

Nature of the project

* Indicate the percentage for each of the options.

New %

100

Rehabilitation %

Expansion %

Other %

Asset Ownership and Operation

*** Will the Ultimate Recipient own and operate the asset?**

Yes

ATIA - 13(1)(c)

ATIA - 14

Location

*** Indicate Province/Territory where the project is located.**

Nunavut

*** Municipality**

Iqaluit[City][NU] Cape Dorset[Hamlet][NU] Kimmirut[Hamlet][NU] Sanikiluaq[Hamlet][NU]

*** If the Municipality is not in the list , enter the name below. You may enter more than one.**

*** A project location map in the form of a .KML file must be uploaded with this application or it will be considered incomplete. Please see the guide on how to produce a .KML file for your project.**

IRIS Place holder KML File.kml

Project Schedule

*** Indicate the percentage of design completed.**

Not Started

*** Forecasted Construction Start Date (YYYY/MM/DD)**

[redacted]

*** Forecasted Construction End Date (YYYY/MM/DD)**

[redacted]

Procurement

*** Will a sole source procurement be used?**

No

Outcomes and Indicators

I confirm that all applicable data has been provided. *

Investment Streams

Select Investment Stream(s)

Rural and Northern Communities

Rural and Northern Communities

Improved broadband connectivity

Type of Project

Internet backbone connecting broadband to a community

Last mile connecting the broadband backbone to individual households

Other

Please describe

providing the fiber optic backbone to a
shoreline location and and Internet service providers
will then distribute to the homes.

Service Area

Number of new households that have access to broadband at project conclusion

3,215

Number of new households that have access to the highest broadband speed range (i.e. 5 to 9.9 Mbps for Nunavut and 25+ Mbps for all other jurisdictions) at project conclusion

3,215

Climate Lens

*** Have you completed a GHG Mitigation assessment for your project?**

No

If you wish to seek a deferral or exemption to the Climate Lens requirements, provide a rationale below, for approval by INFC

Nunavut requests an exemption to the Climate Lens requirements due to the delivery of the project having very few options available to reduce GHG and since the cable will be placed on the ocean floor, the climate change impacts are eliminated. The landing sites consist of buried cable and buried concrete vaults and the impact of climate change is very minimal.

As the most significant aspect of the project is a specialized ship laying cable at the bottom of the ocean, there are no other options to the ship for installing the actual cable

*** Have you completed a Climate Change Resilience assessment for your project?**

No

If you wish to seek a deferral or exemption to the Climate Lens requirements, provide a rationale below, for approval by INFC

Nunavut requests an exemption to the Climate Lens requirements due to the delivery of the project having very few options available to reduce GHG and since the cable will be placed on the ocean floor, the climate change impacts are eliminated. The landing sites consist of buried cable and buried concrete vaults and the impact of climate change is very minimal.

As the most significant aspect of the project is a specialized ship laying cable at the bottom of the ocean, there are no other options to the ship for installing the actual cable

Community Employment Benefits

*** Will the project report on community employment benefits?**

No

*** Please indicate a rationale for not providing information on community employment benefits.**

The personnel that will be hired are very specialized and very few staff are required to actually lay the cable. There are limited opportunities to hire local staff and no targets can be forecasted for other employment groups.

Description of the document	Filename	Date

No data is available in the table

Risk and Mitigation Strategies

Select the factors that have a reasonable likelihood of affecting the project.

* **Project Complexity**

✓ **Remote geographical location**

* **Briefly describe why this is a risk to the project and the mitigation measures**

The Arctic waters weather window is fairly short and sea ice condition may be unpredictable. This is built into the contingency.

✓ **Unpredictable weather**

* **Briefly describe why this is a risk to the project and the mitigation measures**

The Arctic waters weather window is fairly short and sea ice condition may be unpredictable. This is built into the contingency.

Innovative project/technologies

Technical nature of the project

Interdependencies between phases

✓ **Other**

* **Please describe**

The Arctic waters weather window is fairly short and sea ice condition may be unpredictable. This is built into the contingency.

* **Briefly describe why this is a risk to the project and the mitigation measures**

The Arctic waters weather window is fairly short and sea ice condition may be unpredictable. This is built into the contingency.

No risk identified

* **Project Readiness**

Project site hasn't been finalized

*** Briefly describe why this is a risk to the project and the mitigation measures**

Preliminary engineering is nearing completion and is waiting for the vessels to complete Seabed scans.

Land hasn't been acquired

*** Briefly describe why this is a risk to the project and the mitigation measures**

Land leases need to be completed for the landing sites

Potential issues with permits or authorizations (federal, provincial, territorial and municipal)

Industry supply may not be able to meet demand

Other

No risk identified

*** Public Sensitivity**

The project has received positive media attention

*** Briefly describe why this is a risk to the project and the mitigation measures**

Residents, businesses and government are very positive in favour of this project.

The project has received negative media attention

Certain stakeholders have been vocal about the project

*** Briefly describe why this is a risk to the project and the mitigation measures**

The people of Nunavut have been vocal about the need for expanded broadband

Other

No risk identified

*** Ultimate Recipient Risk**

The Ultimate Recipient does not have experience with this type of project

The Ultimate Recipient has low capacity in one or more area: technical expertise, human resources, reporting, delivery of past projects, etc.

*** Briefly describe why this is a risk to the project and the mitigation measures**

The Government of Nunavut will require expertise, project management and additional human resources to be able to successfully deliver this project.

Other

No risk identified

Aboriginal Consultation and Environmental Assessment

Description of the document	Filename	Date
ACES form	Aboriginal Consultation and EA Smart Form - May 30 19.pdf	2019/06/04

Contact Information

*** Please identify the contact (s) to receive correspondence.**

Linda Casson

Document Upload

Description of the document	Filename	Date
No data is available in the table		

Attestation

I attest that the information in this submission has been reviewed and to the best of my knowledge:

1. The information is complete and accurate.
2. Federal funding will support only eligible expenditures and that the project meets the provisions as specified in the Investing in Canada Infrastructure Program (ICIP) Integrated Bilateral Agreement (IBA).
3. The project will be governed under the terms and conditions of the ICIP IBA.

History

Created:

INFC Data Entry - Entrée de données INFC
On: 2018/12/18 11:38:04 AM

Last Updated:

Linda Casson
On: 2019/06/04 3:45:43 PM

Attested:

Linda Casson
On: 2019/06/04 3:45:31 PM

Submitted:

Linda Casson
On: 2019/06/04 3:45:43 PM

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: May 1, 2019 4:42 PM
To: Antinucci, Andrew (INFC)
Subject: RE: INFC Fibre Project Application - May 1 2019 a

I wondered about that.
And re percentage… i can correct this. [redacted]
Shall amend

Linda

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: May 1, 2019 4:36 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: RE: INFC Fibre Project Application - May 1 2019 a

Hi Linda,

Thanks for this. I think for the number of households indicators, the scope for this project would only include dwellings in Iqaluit and Kimmirut, correct? If that's the case, the total number of households (private dwellings) would be 3215 (after investment). In addition, I would note that the number of households that have access to the highest broadband speed range in their jurisdiction *before investment* would be 0, since they only have access to the speeds that satellites would offer (which presumably is slower than what residents could have should they get their internet from fibre). Let me know if this is correct and makes sense.

I also noticed that the design percentage selected was up to 25% - would it not be 26%-50% (based on the 33% of the design complete)?

In regards to the type of project to select in the application, I think you can select "Internet backbone connecting broadband to a community" and note that it's a subsea cable connecting two communities (Iqaluit and Kimmirut) with Nuuk, Greenland.

Let me know if these make sense - happy to chat further.

Andrew

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: May 1, 2019 3:40 PM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: INFC Fibre Project Application - May 1 2019 a

Hi Andrew
I updated the households based on the table.

Cheers

Linda

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: May 2, 2019 9:26 AM
To: Antinucci, Andrew (INFC)
Subject: INFC Fibre Project Application - May 2 2019
Attachments: INFC Fibre Project Application - May 2 2019.docx

Hi Andrew
Revised as per your comments.
Do you need this to be attested again?

Qujannamiik/Merci/Thank You

Linda Casson

ᐊᐅᓚᑦᑎᔨ, ᓄᓇᓕᖕᓂ ᐋᖅᑭᐅᒪᓂᖕᓄᑦ
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Manager, Infrastructure Programs
Department of Community and Government Services
Government of Nunavut

Atanguyaq, Nunalaaniituni
Tunngavikhaliqiyunut
Nunalingni Kavamatkunnilu
Pivikhaqautikkut
Nunavut Kavamanga

Gestionnaire, programmes d'Infrastructure
Ministère des Services communautaires et gouvernementaux,
Gouvernement du Nunavut

☎ 867-975-5336
✉ lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

ICIP Project Application

1 Project Tombstone Information

Project Title	Project ID
Undersea Fibre Optic Cable Installation Linking Greenland and Nunavut	*577001*

Investment Stream

☒ Rural and Northern Communities

Project Description

The Government of Nunavut *Undersea Fibre Optic Cable Installation Linking Greenland and Nunavut* will construct a state-of-the-art submarine fiber optic system connecting Iqaluit and Kimmirut with Nuuk, Greenland. The Nuuk Greenland fibre optic system in turn connects internationally to Milton, Newfoundland and to points in Iceland which then connect with various points in Europe [redacted] An additional component for future consideration would be a fibre optic cable branch from the KRG system to Sanikiluaq in the southern Hudson Bay.

Approximately 1,700 km of fibre optic cable will be installed in the first phase of the project between Kimmirut, Iqaluit and Nuuk, Greenland. This will include all submarine and cable landing infrastructure including the fibre optical cable, powered repeaters, submarine line terminating equipment, power-feed equipment, and system monitoring equipment.

Internet and local Service Providers in Nunavut will then have access to broadband connectivity for service distribution to their customers. The model for distribution/resale has yet to be defined.

The fibre backbone is expected to significantly reduce the cost of bandwidth relative to the current satellite service while dramatically improving the connectivity for the customer which currently averages between 3 Mbps and 15 Mbps. The GN's goal is to meet the Canadian Radio-television and Telecommunications Commission targets of 50 Mbps to all communities in 10 years.

Project Characteristics

Is the asset public facing?	NO
If yes, the highest published accessibility standard, code, or by-laws in the jurisdiction will be met or exceeded	N/A
The highest published applicable energy efficiency standard in the jurisdiction will be met or exceeded	N/A

This project includes housing; early learning and childcare facilities, highways and trade corridor infrastructure, resource development infrastructure, healthcare facilities or education facilities.	NO
This project advances reconciliation with Indigenous peoples	YES

Ultimate Recipient

Name	Government of Nunavut, Community and Government Services
Type	Territorial Government

Location

Province/Territory	Nunavut
Municipality	Iqaluit, Kimmirut

Note: A .KML file must be submitted separately with this application or it will be considered incomplete.

2 Project Finances

Sources of Funds

Are sources of funding secured for the total project costs?" *If no, provide explanation.*	The Gov't of Nunavut has secured $30 million and will be requesting the additional $5 million through the supplementary appropriate process.

Source	Amount ($)
Total Project Costs	[redacted]
Total Eligible Costs	
Program Contribution – Stream 1 *(Rural and Northern Communities)*	
Program Contribution – Stream 2 *(specify)*	
Provincial or Territorial Contribution	[redacted]
Ultimate Recipient Contribution	

Fiscal Year Breakdown - INFC Share (April 1 to March 31)

2018-19		2023-24	
2019-20	[redacted]	2024-25	
2020-21		2025-26	
2021-22		2026-27	
2022-23		2027-28	

3 Project Implementation Details

Nature of the Project *(indicate % for each relevant type)*

100 %	New
%	Rehabilitation
%	Expansion
%	Other (provide explanation)

Asset Ownership

Will the Ultimate Recipient own and operate the asset?	YES
If No, provide additional information	

Percentage of design completed

☒ not started ☐ up to 25% ☐ 26-50% ☐ 51-75% ☐ 76-100%

Construction Dates (DD, Month, YYYY)

Forecasted Construction Start Date	30, July, 2020
Forecasted Construction End Date	31, March, 2022

Sole Source Contracting

Will a sole source procurement be used?	NO
Contract #1	*Detailed information for the contract, as per the Project Submission Guide*
Contract #2	*Detailed information for the contract (add more rows if necessary)*

4 Outcomes, Indicators and Targets

Project outcome

☒ Improved broadband connectivity

Indicators

	Before investment	After Investment
Number of households that have access to the highest broadband speed range in their jurisdiction		9253
Increase in available bandwidth in Iqaluit, Kimmirut	5 – 9.9 Mbps	2613
Increase in available bandwidth in remaining Nunavut communities	5 – 9.9	6640

Project type (Select all that apply)	Internet backbone connecting broadband to a community	

	Last mile connecting the broadband backbone to individual households	
	Other – providing the fiber optic backbone to a shoreline location and internet service providers will then distribute to the consumers.	Yes

5 Climate Lens *(as applicable)*

Have you included a **GHG mitigation assessment** with your project application?	NO – Nunavut will be requesting an exemption		
Have you included a **Climate resilience assessment** with your project application?	NO		
Expected lifespan of the asset*	30 years	Indicate the year in which the expected lifespan of the asset begins	2022
Confirm that the relevant attestation(s) has been completed by a qualified assessor or validator			Yes

**If the project involves multiple assets, please indicate the total lifespan for all assets assessed under the Climate Lens.*

GHG Mitigation Assessment

2030 GHG Results			**Lifetime GHG Results**		
Baseline scenario emissions, cumulative to 2030		0 t / kt / Mt	Baseline scenario emissions, lifetime		0t / kt / Mt
Estimated project emissions, cumulative to 2030		0t / kt / Mt	Estimated project emissions, lifetime		0t / kt / Mt
Net emissions	REDUCTION or INCREASE	t / kt / Mt	Net emissions	REDUCTION or INCREASE	t / kt / Mt

Climate Resilience Assessment

Have risks associated with climate change and extreme weather events in the design, location and planned operation of the project been considered? *Note, these risks could be rapid (e.g. a heavy rainfall) or gradual (sea-level rise) and present or anticipated threats associated with climate change.*	yes

What hazards, associated with climate change and extreme weather events, were identified which may impact the project's integrity and its ability to provide sustained service through its design life? *Select all that apply.*

x	Storm surges		Increased frequency of freeze-thaw cycles
	Higher tides		Increased rainfall
x	Sea level rise		Increased overland flooding
	Coastal erosion		Increased snow loads
	Salt water intrusion		Increased wind speeds or tornadoes
	Heat waves or heat island effect		Hurricanes

	Permafrost degradation		Hail
	Drought		Windstorms
	Wildland fires		Ice storms
	Other *(specify)*		Other *(specify)*

Describe key measures or features of the project that incorporate climate change considerations.	Impact of climate change will be incorporated into the planning for the landing sites.

6 Community employment benefits reporting *(as applicable)*

Does the project include community employment benefits? If yes, provide additional information on targeted groups and % hours worked or value of contracts below. If no, provide rationale.			No
Rationale for not including community employment benefits as part of the project.	The workforce involved with the building and laying of undersea fibre optic cable are highly specialized. Inuit hire will be determined through the NNI process and is expected to be measurable for the building of the landing sites.		
		Will the target group benefit?	**% hours worked**
Which specific groups will you be targeting for employment opportunities on this project? *Provide the % of total project hours that you anticipate each targeted group will work.*	Apprentices	UNKNOWN	%
	Indigenous peoples	YES	%
	Women	UNKNOWN	%
	Persons with disabilities	NO	%
	Veterans	UNKNOWN	%
	Youth	NO	%
	New Canadians	UNKNOWN	%
		Will the target group benefit?	**Total value of contract**
Which types of enterprises will you be targeting? *Provide the total value of contracts.*	Small enterprise	NO	$
	Medium enterprise	NO	
	Social enterprise	NO	

7 Risks and Mitigation Strategies

Project Complexity *(select all that apply)*	**Description and Mitigation Strategies**

☒ Remote Geographical location ☒ Unpredictable weather ☐ Innovative Project/Technologies ☐ Technical nature of the project ☐ Interdependencies between phases ☒ Other (describe) ☐ No risk identified	*The Arctic waters weather window is fairly short and sea ice condition may be unpredictable. This risk has been considered in the contingency.* *The result of the marine survey will confirm the sea bed conditions which will determine the degree of ice scouring, the type of shielding that will be required.*
Project Readiness *(select all that apply)*	**Description and Mitigation Strategies**
☒ Project site selection hasn't been finalized ☒ Land hasn't been acquired ☐ Potential issues with permits or authorizations (federal, provincial, territorial and municipal) ☐ Industry supply may not be able to meet demand ☐ Non-federal sources of funding are not secured for the entire project cost ☐ Other (describe) ☐ No risk identified	*Site selection is done and climate change and mitigation factors have been considered* *Municipal – Landing sites are on Commissioners land and GN is responsible to survey the sites. No issues have been identified.* *Landing in Greenland. Investigating a number of options, lease, negotiating with Telegreenland.*
Public Sensitivity *(select all that apply)*	**Description and Mitigation Strategies**
☒ The project has received positive media attention ☐ The project has received negative media attention ☒ Certain stakeholders have been vocal about the project ☐ Other (describe) ☐ No risk identified	*The people of Nunavut have been vocal about the need for expanded broadband* *Residents, businesses and government are very positive in favour of this project.*
Ultimate Recipient Risk *(select all that apply)*	**Description and Mitigation Strategies**
☐ The Ultimate Recipient does not have experience with this type of project ☒ The Ultimate Recipient has low capacity in one or more area: technical expertise, human resources, reporting, delivery of past projects, etc. ☐ Other (describe) ☐ No risk identified	The Government of Nunavut will require expertise, project management and additional human resources to be able to successfully deliver this project. Resources have been hired for program management and technical consulting

8 Attestation (by the Province or Territory)

I, Tim Brown, Director, Community Infrastructure, Community and Government Services with Government of Nunavut, attest that:

1. The information provided in this project application is complete and accurate.

2. Federal funding will support only Eligible Expenditures and that the project meets the provisions as specified in the ICIP Bilateral Agreement.

3. The project will be governed under the terms of the ICIP Bilateral Agreement.

Dated, this 1th day of November, 2018

____

Signature

ATIA - 21(1)(a)

ATIA - 21(1)(b)

McCallum, Robert (INFC)

From: Nassif, Marie-Pier (INFC)
Sent: May 7, 2019 2:28 PM
To: Brown, Tim
Cc: McCallum, Robert (INFC); Antinucci, Andrew (INFC); Fedyk, Winter; La Rue, Jean-François (INFC)
Subject: RE: Update.

Bonjour Tim,

Further to your exchange of emails with Jean-François yesterday, I would like to outline where we are at on this file:

First, as JF previously mentioned [redacted]

- [redacted]

[redacted]

Note that we are still waiting for your response to the series of questions sent by Robert on April 24. My understanding is that you expected to send these by the end of last week [redacted]

In terms of approval for the project, we see a few options still on the table:

1. [redacted]

- [redacted]

2. [redacted]

3. [redacted]

[redacted]

I will let you digest the above. Let me know if you want us to discuss further over the phone. I can make myself available this afternoon and/or later this week.

On a related but different topic – you have probably been notified already that the DM meeting has been confirmed for Friday May 10, 11:45am to 1:00pm.

Thanks,
Marie-Pier

Marie-Pier Nassif

Director, Program Operations Branch
Infrastructure Canada | Government of Canada
Marie-Pier.Nassif@canada.ca | Tel: 613-960-9422 | Cel [redacted]

Directrice, Direction générale des opérations
Infrastructure Canada | Gouvernement du Canada
Marie-Pier.Nassif@canada.ca | Tél: 613-960-9422 | Cell [redacted]

From: Brown, Tim [mailto:Tim.Brown@GOV.NU.CA]
Sent: May 6, 2019 9:04 AM
To: La Rue, Jean-François (INFC) <jean-francois.larue@canada.ca>
Cc: Nassif, Marie-Pier (INFC) <marie-pier.nassif@canada.ca>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Fedyk, Winter <WFedyk@GOV.NU.CA>
Subject: RE: Update.

Hi Jean-Francois,

Up to your knees in emergencies! I have to tell you, it's very surreal watching these floods from Iqaluit on TV, must be quite the challenge to manage.

Could we entertain a meeting this afternoon or Tuesday afternoon to get a feel for the order of business for the meeting later this week, and review our options?

Also, is 9:00 am on Thursday May 9, open for the meeting between the DMs? Alternatively we can do 11:30 to 12:30 (lunch) on the 9th, or

Thanks,

Tim

Tim Brown
Director
Community Support and Infrastructure
Community and Government Services
(867) 975-5463

From: La Rue, Jean-François (INFC) <jean-francois.larue@canada.ca>
Sent: May 6, 2019 8:44 AM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>
Cc: Nassif, Marie-Pier (INFC) <marie-pier.nassif@canada.ca>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: Update.

Good morning Tim,

As promised last week and sorry for missing the Friday. I was on several emergencies due to the flooding issues in QC, ON and NB.

So we did meet with our colleagues [redacted] ast Thursday.

In summary, [redacted]

We are doing further work to explore possibilities and are preparing some more detailed briefing material for the meeting to take place later this week between our respective DMs; but currently, this is the latest information we have.

I will share with you more details in terms of options going fwd later today or tomorrow. Marie-Pier's team are developing it in preparation for the DM meeting.

Happy to further discuss.

JF

Jean-Francois La Rue

Directeur Général
Infrastructure Canada
Opérations des programmes
Nord, Atlantique, Ontario &
Fond d'atténuation des catastrophes

Director General
Infrastructure Canada
Programs Operations Branch
North, Atlantic, Ontario &
Disaster Mitigation Fund

Tel. Bur/Office: 613 – 960 – 6774
Tel. Cell: 613 – 286 – 2635
Courriel/E-Mail : jean-francois.larue@canada.ca

Infrastructure Canada

Canada

ATIA - 16(2)

McCallum, Robert (INFC)

Subject:	NU Fibre Discussion (New Conference Call Details Appended)
Location:	INFC CONF Ott-180Kent-09-001 CONF INFC
Start:	Wed 2019-05-08 10:00 AM
End:	Wed 2019-05-08 10:30 AM
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	Antinucci, Andrew (INFC)
Required Attendees:	McCallum, Robert (INFC); Trottier-Abbott, Catherine (INFC); Casson, Linda; Brown, Tim; Barry Reimer

Discussion to follow-up on pressing issues regarding the Undersea Fibre Optic Cable Installation Linking Greenland and Nunavut (NU ICIP) project.

*NOTE – Conference call details have been updated below

Call in information:

Local call-in number: 613-960-7510
Toll-free call-in number: 1 877-413-4781
Conference code [redacted]

ATIA - 19(1)

Antinucci, Andrew (INFC)

From:	Antinucci, Andrew (INFC)
Sent:	May 9, 2019 10:59 AM
To:	McCallum, Robert (INFC)
Subject:	FW: INFC Fibre Project Application - May 2 2019
Attachments:	NU Fibre Project - Question-Response Table - 2019-04-24 INFC new questions_GN Response20190508.docx

From: Barry Reimer [mailt[redacted]
Sent: May 9, 2019 10:57 AM
To: 'Casson, Linda' <LCasson@GOV.NU.CA>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: RE: INFC Fibre Project Application - May 2 2019

Hi,

Attached is the revised table of questions/responses.

Regards,
Barry

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: May 9, 2019 7:50 AM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Cc: Barry Reimer [redacted]
Subject: RE: INFC Fibre Project Application - May 2 2019

Here you go and Barry is just working on the revised table.

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: May 9, 2019 10:47 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: RE: INFC Fibre Project Application - May 2 2019
Importance: High

Hi Linda,

Would happen to have the Hanscomb cost-estimate report available? If so, can you forward that to me asap.

Many thanks – happy to chat further if needed.

Regards,

Andrew

Andrew Antinucci

Program Analyst, Program Operations
Infrastructure Canada / Government of Canada
andrew.antinucci@canada.ca / Tel: 613.946.5192

Analyste des programmes, Opérations des programmes
Infrastructure Canada / Gouvernement du Canada
andrew.antinucci@canada.ca / Tél. : 613.946.5192

Infrastructure Canada   Canada

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: May 3, 2019 9:01 AM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: RE: INFC Fibre Project Application - May 2 2019

Have a great day!

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: May 2, 2019 6:14 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: RE: INFC Fibre Project Application - May 2 2019

HI Linda,

Thanks for this. Let me review this again and I'll get back to you regarding another attestation.

Regards,

Andrew Antinucci

Program Analyst, Program Operations
Infrastructure Canada / Government of Canada
andrew.antinucci@canada.ca / Tel: 613.946.5192

Analyste des programmes, Opérations des programmes
Infrastructure Canada / Gouvernement du Canada
andrew.antinucci@canada.ca / Tél. : 613.946.5192

Infrastructure Canada   Canada

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: May 2, 2019 9:26 AM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: INFC Fibre Project Application - May 2 2019

Hi Andrew
Revised as per your comments.
Do you need this to be attested again?

Qujannamiik/Merci/Thank You

Linda Casson

ᐊᐅᓚᑦᑎᔨ, ᓄᓇᓕᖕᓂ ᐋᖅᑭᐅᒪᓂᖕᓄᑦ
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Manager, Infrastructure Programs
Department of Community and Government Services
Government of Nunavut

Atanguyaq, Nunalaaniituni
Tunngavikhaliqiyunut
Nunalingni Kavamatkunnilu
Pivikhaqautikkut
Nunavut Kavamanga

Gestionnaire, programmes d'Infrastructure
Ministère des Services communautaires et gouvernementaux,
Gouvernement du Nunavut

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

Pages 358-412
are withheld
pursuant to paragraphs
13(1)(c), 14, 15(1), 16(2), 19(1) & 21(1)(b)
of the *Access to Information Act*

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Les pages 358-412
Font l’objet d’une exception totale
conformément aux dispositions des
paragraphes
13(1)(c), 14, 15(1), 16(2), 19(1) & 21(1)(b)
de la *loi sur l’accès à l’information*

ATIA - 13(1)(c)
ATIA - 14
ATIA - 21(1)(b)

McCallum, Robert (INFC)

From: Brown, Tim <Tim.Brown@GOV.NU.CA>
Sent: May 14, 2019 2:35 PM
To: McCallum, Robert (INFC); Casson, Linda; Antinucci, Andrew (INFC); Nassif, Marie-Pier (INFC)
Cc: Passy, Stephen (INFC); 'Barry Reimer'
Subject: RE: Project Financials

Hi Robert,

Have been working on this very problem the past two days. Barry should have new projections shortly.

Will get Linda to confirm with Stephen [redacted]

Thanks,

Tim

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: May 14, 2019 1:21 PM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>; Casson, Linda <LCasson@GOV.NU.CA>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Nassif, Marie-Pier (INFC) <marie-pier.nassif@canada.ca>
Cc: Passy, Stephen (INFC) <stephen.passy@canada.ca>
Subject: Project Financials

Hi Tim

We'd like to go forward with the teleconference tomorrow. Andrew will be on the call. I will be on a train, and will try to call in, but the service can be spotty so that may not work.

[redacted]

Right now, [redacted] It will not go very far until the project cost is established.

Andrew will likely have a couple of other points to discuss with you.

Robert G. McCallum, P.Eng.
(613) 948-9450
robert.mccallum@canada.ca

ATIA - 13(1)(c)
ATIA - 14
ATIA - 21(1)(b)

Trottier-Abbott, Catherine (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: May 21, 2019 11:25 AM
To: Trottier-Abbott, Catherine (INFC)
Cc: McCallum, Robert (INFC); Barry Reimer
Subject: RE: NIRB 125425 / 18UN050: Screening Decision Report for the GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

Hi Kate

[redacted]

Please let me know if you need any further info

Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Sent: May 21, 2019 11:13 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: RE: NIRB 125425 / 18UN050: Screening Decision Report for the GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

Hi Linda,
I hope you are well. I am reviewing my notes on the undersea fibre optic cable project and was wondering if you have any updates on the consultation [redacted]

Many thanks,
Kate

8

ATIA - 19(1)

From: Trottier-Abbott, Catherine (INFC)
Sent: March 4, 2019 2:05 PM
To: Casson, Linda <LCasson@GOV.NU.CA>; Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>
Cc: Barry Reime[redacted]
Subject: RE: NIRB 125425 / 18UN050: Screening Decision Report for the GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

Thanks Linda! ☺

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: February-28-19 2:58 PM
To: Djordjevic, Ana (INFC) <ana.djordjevic@canada.ca>; Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>
Cc: Barry Reime[redacted]
Subject: FW: NIRB 125425 / 18UN050: Screening Decision Report for the GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

Great news! NIRB screening complete.

Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: Bouchard, Jean-Francois
Sent: February 28, 2019 1:34 PM
To: Wells, Dean <Dean.Wells@gov.nu.ca>; Hickey, Ted <Ted.Hickey@gov.nu.ca>; Barry Reime[redacted]
Cc: Devereaux, Eiryn <EDevereaux@GOV.NU.CA>; Mulak, Paul <PMulak@GOV.NU.CA>; Casson, Linda <LCasson@GOV.NU.CA>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: FW: NIRB 125425 / 18UN050: Screening Decision Report for the GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

Hi All,

This is to inform you that the NIRB screening has been completed.

Highlight
"Subject to the Proponent's compliance with the terms and conditions as set out in below, **the NIRB is of the view that the project proposal is not likely to cause significant public concerns, and it is unlikely to result in significant adverse environmental and social impacts**. The NIRB therefore recommends that the responsible Minister accepts this Screening Decision Report."

(9)

From: NIRB Enterprise Management System <noreply@nirb.ca>
Sent: Thursday, February 28, 2019 1:25 PM
To: info@nirb.ca
Subject: NIRB 125425 / 18UN050: Screening Decision Report for the GN's "UnderSea Fibre Optic Cable Installation" Project Proposal

Dear Jean-Francois Bouchard:

Please find attached the Nunavut Impact Review Board's (NIRB or Board) Cover Letter and the Screening Decision Report for the Government of Nunavut's (GN) "UnderSea Fibre Optic Cable Installation" project proposal (NIRB: 18UN050; NPC: 148937).

Further, please note that the Notice of Release of Screening Decision Report for this file will be forwarded to the offices responsible for issuing any authorizations related to this project.

Best regards,

Cassel Kapolak
Environmental Administrator

Nunavut Impact Review Board
29 Mitik Street
P.O. Box 1360
Cambridge Bay
NU, X0B 0C0 Canada
Phone: (867) 983-4600
Toll Free: 1-866-233-3033
Fax: (867) 983-2594
Email: info@nirb.ca
Web: www.nirb.ca

ATIA - 19(1)

McCallum, Robert (INFC)

From:	Barry Reimer[redacted]
Sent:	May 22, 2019 10:24 AM
To:	Antinucci, Andrew (INFC); McCallum, Robert (INFC)
Subject:	Emailing: GN Fibre Business Case - May 2019 Update_20190521.pdf
Attachments:	GN Fibre Business Case - May 2019 Update_20190521.pdf

Your message is ready to be sent with the following file or link attachments:

GN Fibre Business Case - May 2019 Update_20190521.pdf

Note: To protect against computer viruses, e-mail programs may prevent sending or receiving certain types of file attachments. Check your e-mail security settings to determine how attachments are handled.

Pages 419-469
are withheld
pursuant to paragraphs
13(1)(c) & 14
of the *Access to Information Act*

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Les pages 419-469
Font l'objet d'une exception totale
conformément aux dispositions des
paragraphes
13(1)(c) & 14
de la *loi sur l'accès à l'information*

Antinucci, Andrew (INFC)

From: Antinucci, Andrew (INFC)
Sent: May 22, 2019 10:32 AM
To: 'Brown, Tim'
Subject: RE: GN Fibre Project Discussion

Hey Tim – sorry to hear – hope all goes well.

Barry is on the line, but Winter isn't.

Andrew

From: Brown, Tim [mailto:Tim.Brown@GOV.NU.CA]
Sent: May 22, 2019 10:29 AM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: RE: GN Fibre Project Discussion

Hi Anthony,

Sorry, [redacted] Are Barry and Winter on the call?

Tim

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: May 22, 2019 9:49 AM
To: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Trottier-Abbott, Catherine (INFC) <catherine.trottier-abbott@canada.ca>; Casson, Linda <LCasson@GOV.NU.CA>; Brown, Tim <Tim.Brown@GOV.NU.CA>; Barry Reimer [redacted]; Wells, Dean <Dean.Wells@gov.nu.ca>
Subject: RE: GN Fibre Project Discussion

Hi all – just wanted to check in that we (INFC) still plan to hold the call today. Let me know if there are any issues.

Andrew

-----Original Appointment-----
From: Antinucci, Andrew (INFC)
Sent: May 15, 2019 10:34 AM
To: Antinucci, Andrew (INFC); McCallum, Robert (INFC); Trottier-Abbott, Catherine (INFC); Casson, Linda; Brown, Tim; Barry Reimer; Wells, Dean
Subject: GN Fibre Project Discussion
When: May 22, 2019 10:00 AM-10:30 AM (UTC-05:00) Eastern Time (US & Canada).
Where: INFC CONF Ott-180Kent-09-001 CONF INFC

ATIA - 19(1)

ATIA - 21(1)(b)

McCallum, Robert (INFC)

From: McCallum, Robert (INFC)
Sent: May 23, 2019 12:42 PM
To: 'Brown, Tim'
Subject: RE: Sole source contracts

For this contract, we'll include it in the Minister's approval letter he sends to you [redacted]. If you are aware of any other s-s contracts, let us know and we'll fold them in, too. Cut off for that would be around mid-June.

After that, I'm checking to see if the Minister delegates this decision to officials. Not sure.

From: Brown, Tim [mailto:Tim.Brown@GOV.NU.CA]
Sent: May 22, 2019 5:23 PM
To: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: RE: Sole source contracts

Thanks Robert, it really helps when things are spelled out.

Regarding the sole source issue, that was my understanding of the situation and I am glad this meets the ministerial threshold. However, is this kind of ministerial decision impacted by the federal election?

Tim

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: May 22, 2019 5:08 PM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>; Casson, Linda <LCasson@GOV.NU.CA>; Barry Reimer [redacted]
Cc: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Passy, Stephen (INFC) <stephen.passy@canada.ca>; Robbins, Laura (INFC) <laura.robbins@canada.ca>; Nassif, Marie-Pier (INFC) <marie-pier.nassif@canada.ca>
Subject: Sole source contracts

Tim, Linda and Barry:

This morning I indicated I would follow up on the sole-source contract issued Barry raised.

Generally speaking, sole-source contracts are not allowed under our programs without Treasury Board approval.

However, there are situations where our Minister has the authority to approve projects with sole source contracts. Under ICIP, one of these situations is service contracts under $100,000 in value.

Barry noted that you may hire the consultant assisting you with permitting on a sole source basis, and that the value of this contact would likely be in the $25,000 range. Our Minister would have the authority to approve that. Note that approval is not automatic – you would still need to provide an explanation why you wish to not tender the contract; in this case it would simply be that it is uneconomic to solicit bids for small-value contracts.

Please continue to bring your intentions regarding such sole source contracts to our attention as soon as possible so that we can determine eligibility as early as possible and avoid situations where you inadvertently cause them to be ineligible.

And as per our discussion from last week, remember that any contracts you wish to be eligible for federal funding cannot be signed (which is normally the "irrevocable decision to proceed" point I mentioned) until federal approval of the project is granted. A key aspect that has tripped up recipients in past: it's not just the part of the contract that occurs before approval that would be ineligible. The entire contract would be ineligible if it is signed even one day before approval.

As always, we are available to advise you on such program details.

Robert G. McCallum, P.Eng.
(613) 948-9450
robert.mccallum@canada.ca

ATIA - 19(1)

ATIA - 13(1)(c)

ATIA - 14

McCallum, Robert (INFC)

From: Barry Reime[redacted]
Sent: May 24, 2019 4:16 PM
To: McCallum, Robert (INFC); Antinucci, Andrew (INFC)
Cc: 'Linda Casson'; 'Tim Brown'
Subject: RE: Schedule question
Attachments: O5568 190523 Nunavut FOC Rev2.pdf; NU Fibre Project - Question-Response Table - 2019-05-23 INFC new questions_GN Response20190524.docx

Hi Robert and Andrew,

As discussed our earlier call I am attaching the latest update to the Hanscomb estimate that we received yesterday, following further discussions and feedback Hanscomb received from suppliers this week. [redacted]

With respect to your question below from yesterday, I have added the question and our response to the attached running question/response log, just to make it easier to track. We can discuss any clarifying questions you have on our call on Monday morning.

Regards,
Barry

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: May 23, 2019 1:44 PM
To: Barry Reime[redacted] Linda Casson <LCasson@GOV.NU.CA>; Tim Brown <Tim.Brown@GOV.NU.CA>
Cc: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: Schedule question

Yesterday I noted to Tim that we had a questio[redacted]

Robert G. McCallum, P.Eng.
(613) 948-9450
robert.mccallum@canada.ca

Pages 475-532
are withheld
pursuant to paragraphs
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of the *Access to Information Act*

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Les pages 475-532
Font l'objet d'une exception totale
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13(1)(c), 14, 15(1), 16(2) & 21(1)(b)
de la *loi sur l'accès à l'information*

ATIA - 13(1)(c)

ATIA - 14

ATIA - 21(1)(b)

Antinucci, Andrew (INFC)

From:	Antinucci, Andrew (INFC)
Sent:	May 25, 2019 6:47 PM
To:	'Casson, Linda'; Robbins, Laura (INFC)
Cc:	McCallum, Robert (INFC); Brown, Tim
Subject:	RE: [redacted]

Hey Linda – no problem. I pushed the call to 11-12pm on Monday.

Chat soon!

Andrew

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: May 25, 2019 3:14 PM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Robbins, Laura (INFC) <laura.robbins@canada.ca>
Cc: McCallu[redacted]llum@canada.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: [redacted]

Hello everyone

[redacted]

Perhaps a call mid-Monday afternoon? I'll check with Tim first thing Monday to learn if there has been movement on this issue on Friday.

Linda

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: May 24, 2019 1:34 PM
To: Robbins, Laura (INFC) <laura.robbins@canada.ca>; Casson, Linda <LCasson@GOV.NU.CA>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: [redacted]

ATIA - 13(1)(c)
ATIA - 16(2)
ATIA - 14
ATIA - 21(1)(b)

Hi all – per Laura's email below [redacted]

A

From: Robbins, Laura (INFC)
Sent: May 24, 2019 12:22 PM
To: Casson, Linda <LCasson@GOV.NU.CA>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE [redacted]

Hi Linda,

Unfortunately I won't be able to join the call scheduled to start shortly as I have a conflict at the same time.

[redacted]

Let me know if you want to chat through any of the implications of this. I am working from home today and Monday but my schedule is generally free.

Thanks,
Laura

Laura Robbins

Program Analyst, Program Operations
Infrastructure Canada / Government of Canada
laura.robbins@canada.ca / Tel: 613-960-0855 / Cel: [redacted]

Analyste des programmes, Opérations des programmes
Infrastructure Canada / Gouvernement du Canada
laura.robbins@canada.ca / Tél. : 613-960-0855 / Tél. Cell : [redacted]

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: May 23, 2019 1:37 PM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Robbins, Laura (INFC) <laura.robbins@canada.ca>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: [redacted]

Thanks, Andrew

[redacted]

ATIA - 13(1)(c)
ATIA - 14
ATIA - 21(1)(b)

Cheers

Linda

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: May 23, 2019 1:30 PM
To: Casson, Linda <LCasson@GOV.NU.CA>; Robbins, Laura (INFC) <laura.robbins@canada.ca>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: [redacted]

No problem Linda – happy to help where possible.

[redacted]

Happy to chat further.

Andrew

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: May 23, 2019 1:25 PM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Robbins, Laura (INFC) <laura.robbins@canada.ca>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: RE: [redacted]

Thank you, Andrew and Laura, for all your work on this.

[redacted]

I appreciate your time on this as I can only guess how busy you are.

Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

ATIA - 14

ATIA - 21(1)(b)

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: May 23, 2019 1:00 PM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>; Casson, Linda <LCasson@GOV.NU.CA>
Cc: Robbins, Laura (INFC) <laura.robbins@canada.ca>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: RE: [redacted]

Hi Tim and Linda,

[redacted]

Let me know if this makes sense – happy to chat further if needed.

Regards,

Andrew Antinucci

Program Analyst, Program Operations
Infrastructure Canada / Government of Canada
andrew.antinucci@canada.ca / Tel: 613.946.5192

Analyste des programmes, Opérations des programmes
Infrastructure Canada / Gouvernement du Canada
andrew.antinucci@canada.ca / Tél. : 613.946.5192

Infrastructure Canada

Canada

From: Robbins, Laura (INFC)
Sent: May 23, 2019 10:30 AM
To: Brown, Tim <Tim.Brown@gov.nu.ca>
Cc: Casson, Linda <LCasson@gov.nu.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: Re: [redacted]

Hi Tim,

Andrew is actually working on [redacted]

Stay tuned!
Laura

Sent from my iPhone

ATIA - 13(1)(c)
ATIA - 14
ATIA - 21(1)(b)

On May 23, 2019, at 10:27 AM, Brown, Tim <Tim.Brown@gov.nu.ca> wrote:

Hi Laura,

[redacted]

Thanks,

Tim

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: May 23, 2019 9:25 AM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: FW: [redacted]

The response you requested.

From: Robbins, Laura (INFC) <laura.robbins@canada.ca>
Sent: May 21, 2019 2:41 PM
To: Casson, Linda <LCasson@GOV.NU.CA>; Passy, Stephen (INFC) <stephen.passy@canada.ca>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: RE: [redacted]

Linda,

As requested, a final clarification to add to my list below:

[redacted]

Thanks
Laura

From: Robbins, Laura (INFC)
Sent: May 21, 2019 11:04 AM
To: Casson, Linda <LCasson@GOV.NU.CA>; Passy, Stephen (INFC) <stephen.passy@canada.ca>

Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: [redacted]

Hi Linda,

[redacted]

Please let me know if you need any additional clarifications.

Thanks,
Laura

Laura Robbins

Program Analyst, Program Operations
Infrastructure Canada / Government of Canada
laura.robbins@canada.ca / Tel: 613-960-0855 / Cel: 613-790-1715

Analyste des programmes, Opérations des programmes
Infrastructure Canada / Gouvernement du Canada
laura.robbins@canada.ca / Tél. : 613-960-0855 / Tél. Cell : 613-790-1715

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: May 20, 2019 3:26 PM
To: Passy, Stephen (INFC) <stephen.passy@canada.ca>; Robbins, Laura (INFC) <laura.robbins@canada.ca>
Subject: [redacted]

Hi o wise people

[redacted]

[redacted]

Help…..

Qujannamiik/Merci/Thank You

Linda Casson

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Manager, Infrastructure Programs
Department of Community and Government Services
Government of Nunavut

Atanguyaq, Nunalaaniituni
Tunngavikhaliqiyunut
Nunalingni Kavamatkunnilu Pivikhaqautikkut
Nunavut Kavamanga

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ATIA - 13(1)(c)

ATIA - 14

[redacted]

[redacted]

Pages 541-547
are withheld
pursuant to paragraphs
13(1)(c) & 14
of the *Access to Information Act*

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Les pages 541-547
Font l'objet d'une exception totale
conformément aux dispositions des
paragraphes
13(1)(c) & 14
de la *loi sur l'accès à l'information*

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: May 27, 2019 10:20 AM
To: Antinucci, Andrew (INFC)
Subject: RE: draft project description

Awrighty, will add to IRIS

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: May 27, 2019 10:19 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: RE: draft project description

This looks great - thanks for this!

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: May 27, 2019 9:36 AM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: draft project description

Hi Andrew
Does this have the information needed? Still too long?

Linda

McCallum, Robert (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: May 29, 2019 9:32 AM
To: Antinucci, Andrew (INFC); McCallum, Robert (INFC)
Cc: Barry Reimer; Brown, Tim
Subject: FW: Updated Business Case Document for Submission to INFC
Attachments: GN Fibre Business Case - May 2019 Update_20190528.pdf

Good morning, Andrew and Robert
Here is the revised business case reflecting the final decision on the amount available.
I'm working on the IRIS to reflect this. Ran into a bit of a technical glitch but our tech people resolved it.

Cheers

Qujannamiik/Merci/Thank You

Linda Casson

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Pages 550-600
are withheld
pursuant to paragraphs
13(1)(c) & 14
of the *Access to Information Act*

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Les pages 550-600
Font l'objet d'une exception totale
conformément aux dispositions des
paragraphes
13(1)(c) & 14
de la *loi sur l'accès à l'information*

ATIA - 14

ATIA - 19(1)

Antinucci, Andrew (INFC)

From:	Barry Reimer [redacted]
Sent:	May 29, 2019 11:35 AM
To:	'Casson, Linda'; Antinucci, Andrew (INFC)
Subject:	RE: Updated Business Case Document for Submission to INFC
Attachments:	GN Fibre Business Case - May 2019 Update_20190529.docx

Hi,

Word version as requested. [redacted] as per the discussion on our call, but otherwise it is the same as the pdf version sent out this morning.

Regards,
Barry

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: May 29, 2019 6:32 AM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Cc: Barry Reime[redacted] Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: FW: Updated Business Case Document for Submission to INFC

Good morning, Andrew and Robert
Here is the revised business case reflecting the final decision on the amount available.
I'm working on the IRIS to reflect this. Ran into a bit of a technical glitch but our tech people resolved it.

Cheers

Qujannamiik/Merci/Thank You

Linda Casson

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Pages 602-652
are withheld
pursuant to paragraphs
13(1)(c) & 14
of the *Access to Information Act*

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Les pages 602-652
Font l'objet d'une exception totale
conformément aux dispositions des
paragraphes
13(1)(c) & 14
de la *loi sur l'accès à l'information*

McCallum, Robert (INFC)

From:	Antinucci, Andrew (INFC)
Sent:	May 30, 2019 9:25 PM
To:	Brown, Tim; Casson, Linda; Barry Reimer; Wells, Dean
Cc:	McCallum, Robert (INFC)
Subject:	Nunavut Undersea Fibre Optic Cable Project Q&A Table
Attachments:	Nunavut Undersea Fibre Project Q&A Table 2019-05-30.docx
Importance:	High

Hi all,

We received a long list of questions from our internal review yesterday afternoon, and are able to respond to most of them, but we will need assistance with several – see attached. We are hoping we can get a preliminary signal check on these answers during the call tomorrow, and by **EOD Friday**, we will need answers to these in order to continue to proceed with the project.

In addition – based on the scope of work detailed under PT Base Fund (BCF), we will need revised cash flows **as soon as possible** as that will help us determine eligible and non-eligible costs. Furthermore, we want to confirm that all costs associated with operational plans (i.e. commercialization studies and confirmation that the costs associated with the Network Operations Centre are capital construction costs). This would likely result in a revised ICIP application as well so as to ensure there is consistency across all documents.

Looking forward to our chat tomorrow.

Andrew Antinucci

Program Analyst, Program Operations
Infrastructure Canada / Government of Canada
andrew.antinucci@canada.ca / Tel: 613.946.5192

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Infrastructure Canada / Gouvernement du Canada
andrew.antinucci@canada.ca / Tél. : 613.946.5192

Infrastructure Canada

Canada

Pages 654-655
are withheld
pursuant to paragraphs
14 & 21(1)(b)
of the *Access to Information Act*

****

Les pages 654-655
Font l'objet d'une exception totale
conformément aux dispositions des
paragraphes
14 & 21(1)(b)
de la *loi sur l'accès à l'information*

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: May 30, 2019 4:22 PM
To: Antinucci, Andrew (INFC)
Subject: don't worry about resending ACES form

Hi
I'm just redoing it....but we should note that there are challenges to revising the form once initially completed

Cheerio

Qujannamiik/Merci/Thank You

Linda Casson

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Manager, Infrastructure Programs
Department of Community and Government Services
Government of Nunavut

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Nunalingni Kavamatkunnilu
Pivikhaqautikkut
Nunavut Kavamanga

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ATIA - 14

ATIA - 21(1)(b)

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: May 30, 2019 4:43 PM
To: McCallum, Robert (INFC); Brown, Tim
Cc: Maryan, Christopher (INFC); Antinucci, Andrew (INFC); Robbins, Laura (INFC)
Subject: RE [redacted]

Thank you, Robert
This is very helpful and very timely information.

Look forward to the conversation tomorrow but I think you have laid out a very clear path for us to follow

Qujannamiik/Merci/Thank You

Linda Casson

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: May 30, 2019 4:40 PM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>; Casson, Linda <LCasson@GOV.NU.CA>
Cc: Maryan, Christopher (INFC) <christopher.maryan@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Robbins, Laura (INFC) <laura.robbins@canada.ca>
Subject: RE: [redacted]

Hi Linda and Tim

We've looked at this in some detail, and have concluded the following:

[redacted]

[redacted]

We can discuss more tomorrow during our call.

Rob

From: Antinucci, Andrew (INFC)
Sent: May 29, 2019 4:59 PM
To: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: FW: [redacted]

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: May 29, 2019 4:57 PM
To: Maryan, Christopher (INFC) <christopher.maryan@canada.ca>
Cc: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>; Barry Reimer <[redacted]>; Pudluk, Juanie <JPudluk@GOV.NU.CA>
Subject: RE: [redacted]

Hi Chris
Thank you so much for walking us through this process.

[redacted]

Please advise if you need anything further.

Qujannamiik/Merci/Thank You

Linda Casson

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Manager, Infrastructure Programs
Department of Community and Government Services
Government of Nunavut

Atanguyaq, Nunalaaniituni
Tunngavikhaliqiyunut
Nunalingni Kavamatkunnilu
Pivikhaqautikkut

Gestionnaire, programmes d'Infrastructure
Ministère des Services communautaires et gouvernementaux,
Gouvernement du Nunavut

ATIA - 14

ATIA - 21(1)(b)

Nunavut Kavamanga

867-975-5336
lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

From: Maryan, Christopher (INFC) <christopher.maryan@canada.ca>
Sent: May 29, 2019 3:50 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Subject: [redacted]

Hi Linda,

[redacted]

[redacted] please send me an e-mail confirming the new work.

Cheers,

Chris

Christopher Maryan
Analyst, Program Operations, West
Infrastructure Canada / Government of Canada
Suite 9-025B, 180 Kent Street, Ottawa
christopher.maryan@canada.ca
Tel: 613-960-8090

McCallum, Robert (INFC)

From:	Brown, Tim <Tim.Brown@GOV.NU.CA>
Sent:	May 31, 2019 10:57 AM
To:	Nassif, Marie-Pier (INFC); McCallum, Robert (INFC)
Cc:	Antinucci, Andrew (INFC); Casson, Linda
Subject:	FW: Support Letter on Fibre Link for Nunavut
Attachments:	Letter to Hon Bains and Champagne Fibre Link.pdf

Hi Marie Pier and Team!

Just wanted to share this for your files.

Tim

Tim Brown
Director
Community Support and Infrastructure
Community and Government Services
(867) 975-5463

From: Hourie, Constance <CHourie@GOV.NU.CA>
Sent: May 31, 2019 10:56 AM
To: 'john.knubley@canada.ca' <john.knubley@canada.ca>; 'kelly.gillis@canada.ca' <kelly.gillis@canada.ca>
Cc: Brown, Tim <Tim.Brown@GOV.NU.CA>; Fedyk, Winter <WFedyk@GOV.NU.CA>; Pruitt, Tajah <TPruitt@GOV.NU.CA>; Devereaux, Eiryn <EDevereaux@GOV.NU.CA>
Subject: FW: Support Letter on Fibre Link for Nunavut

Good morning colleagues,

Attached is a letter from my Minister to yours indicating the Government of Nunavut's support for the fibre project. Please let me know if you have any questions about it, or would like to chat further. Thanks again for all your support on this file. [redacted]

Constance

Constance Hourie, LL.B.

Deputy Minister
Community and Government Services
Government of Nunavut

Ministaup Tuglia
Nunalingni Kavamatkunillu Pivikhaqautikkut
Nunavut Kavamanga

Sous-ministre
Services communautaires et gouvernementaux
Gouvernement du Nunavut

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CHourie@gov.nu.ca www.gov.nu.ca

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Building Nunavut Together
Nunavuliuqatigiingniq
Bâtir le Nunavut ensemble

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Nunavut

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Minister of Community and Government Services
Ministaat Nunalingni Kavamatkunillu Pivikhakautikkut
Ministre des Services communautaires et gouvernementaux

The Honourable Navdeep Bains
Minister of Innovation, Science and Economic Development
House of Commons
Ottawa, Ontario, Canada
K1A 0A6

MAY 3 1 2019

The Honourable François-Philippe Champagne
Minister of Infrastructure and Communities
House of Commons
Ottawa, Ontario, Canada
K1A 0A6

Dear Ministers Bains and Champagne,

I am writing to seek your support for the Government of Nunavut's project to provide a fibre optic link between Iqaluit, Nunavut and Nuuk, Greenland.

It is important for me to personally convey, on behalf of the Government of Nunavut, how critical this project is to the development of Nunavut and improving the quality of life of Nunavummiut across the territory. Indeed, this project fulfills a major objective of my government's Turaaqtavut mandate of PIVAALLIRUTIVUT: "Connecting Nunavummiut to one another and the rest of Canada through strategic investment in infrastructure such as roads, telecommunications, and transportation." This project is the cornerstone of Nunavut's telecommunication strategy, which aims to close the digital divide between Nunavummiut and the rest of Canada and to achieve the Canadian Radio and Telecommunication Commission's (CRTC) target of access to internet speeds of at least 50 Mbps for downloads and 10 Mbps for uploads for all Canadians.

I appreciate the close collaboration between our officials in moving this project forward. As you can appreciate, it is a challenge for a smaller jurisdiction like ours to enter into a project of this size and complexity, so we appreciate your flexibility to minimize the financial and operational risk to the Government of Nunavut as it seeks to secure better connectivity for the Nunavummiut people.

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Iqaluit, Nunavut X0A 0H0

Titiqaniarvia 2410
Iqaluit, Nunavut X0A 0H0

P.O. Box 2410
Iqaluit, Nunavut X0A 0H0

C. P. 2410
Iqaluit, Nunavut X0A 0H0

867-975-5074
867-975-2034

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Building Nunavut Together
Nunavuliuqatigiingniq
Bâtir le Nunavut ensemble
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Minister of Community and Government Services
Ministaat Nunalingni Kavamatkunillu Pivikhakautikkut
Ministre des Services communautaires et gouvernementaux

I understand that the Prime Minister recently announced a new Digital Charter for Canadians, which seeks to foster innovation while building trust in digital societies and economies. This is a worthy initiative that also serves to highlight the gap between Nunavut and the rest of Canada in terms of access to basic telecommunications infrastructure. As such, I appreciate your willingness to signal your support for our fibre project [redacted] s federal funding approval will enable our government to engage outside expertise through a Request for Proposal (RFP) process. This will provide us with better cost certainty, and flag for our people that their ability to connect with their fellow citizens and the outside world is a priority for government.

In addition to the fibre connection between Iqaluit and Nuuk, we are also actively exploring the development of other emerging communication solutions, such as low earth orbit satellite constellations, as well as ongoing capacity increases to conventional satellites. Nevertheless, the Nunavut to Greenland fibre connection represents our best chance of meeting all of our telecommunication objectives in the long run, by anchoring the entire system with a government owned and operated trunk of fibre from which a whole network can grow.

In the short term, the Nunavut to Greenland fibre connection will allow for the redistribution of satellite broadband across the Territory, meaning that there will be a drastic improvement in connectivity for 8,000 Iqalungmiut, as well as for all Nunavummiut. In tandem with our pursuit of improvements to satellite technology, this will support economic development, as well as enable the adoption of digital government solutions in the fields of Education, Health and Justice.

I also want to assure you that we are working closely with our counterparts in the Kivalliq Inuit Association (KIA) as they plan to bring broadband from Gillam, Manitoba, to five northern Kivalliq communities, and with the Kativik Regional Government (KRG) as it plans its proposed Eastern Arctic Undersea Fibre Optic Network. These lines have the potential to provide essential redundancy capacity to Nunavut's main fibre line between Iqaluit and Nuuk.

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Minister of Community and Government Services
Ministaat Nunalingni Kavamatkunillu Pivikhakautikkut
Ministre des Services communautaires et gouvernementaux

I cannot overstate the impact that improving broadband connection in Nunavut will have in the Territory. Thank you for your support of the Nunavut to Greenland fibre connection.

Sincerely,

The Hon. Lorne Kusugak
Minister of Community and Government Services
Minister of Human Resources

Cc. Premier of Nunavut
Deputy Minister, Community and Government Services

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867-975-5074
867-975-2034

ATIA - 14
ATIA - 19(1)
ATIA - 21(1)(b)

Antinucci, Andrew (INFC)

From: Antinucci, Andrew (INFC)
Sent: June 3, 2019 4:05 PM
To: 'Casson, Linda'
Cc: McCallum, Robert (INFC); 'Barry Reimer'
Subject: RE: Nunavut Undersea Fibre Optic Cable Project Q&A Table

Thanks Linda – much appreciated. We will take a look at this and get back to you if there are any issues.

[redacted]

Andrew

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: June 3, 2019 11:39 AM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; 'Barry Reimer' [redacted]
Subject: FW: Nunavut Undersea Fibre Optic Cable Project Q&A Table

Hi Andrew
Attached is the latest responses to your questions.

Linda

From: Barry Reime[redacted]
Sent: June 3, 2019 11:19 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: Woodbury, Grant <GWoodbury@GOV.NU.CA>; Fedyk, Winter <WFedyk@GOV.NU.CA>; Hickey, Ted <Ted.Hickey@gov.nu.ca>; Brown, Tim <Tim.Brown@GOV.NU.CA>; Wells, Dean <Dean.Wells@gov.nu.ca>
Subject: RE: Nunavut Undersea Fibre Optic Cable Project Q&A Table

Hi Linda,

Attached is a final version of the Q&A and a pdf copy of the strategy presentation to send to INFC. Thanks all for your comments and information!

Regards,
Barry

From: Hickey, Ted <Ted.Hickey@gov.nu.ca>
Sent: June 3, 2019 7:37 AM
To: Casson, Linda <LCasson@GOV.NU.CA>; Brown, Tim <Tim.Brown@GOV.NU.CA>; 'Barry Reimer'[redacted]; Wells, Dean <Dean.Wells@gov.nu.ca>
Cc: Woodbury, Grant <GWoodbury@GOV.NU.CA>; Fedyk, Winter <WFedyk@GOV.NU.CA>
Subject: RE: Nunavut Undersea Fibre Optic Cable Project Q&A Table

ATIA - 14

ATIA - 19(1)

ATIA - 21(1)(b)

Hi Barry,

We have updated the comments to the document (with track changes on so you can see what was added) and have attached.

We have also attached the Fibre presentation that was used in March 2019 that shows our plan/roadmap. Have a low at this to see if it will meet the needs for Strategy question [redacted]

Let us know if you need anything else.

Ted

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: June 3, 2019 8:47 AM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>; 'Barry Reimer' [redacted] Wells, Dean <Dean.Wells@gov.nu.ca>; Hickey, Ted <Ted.Hickey@gov.nu.ca>
Cc: Woodbury, Grant <GWoodbury@GOV.NU.CA>; Fedyk, Winter <WFedyk@GOV.NU.CA>
Subject: RE: Nunavut Undersea Fibre Optic Cable Project Q&A Table

Thanks for this information.
I'll wait until Ted and Dean have a chance to respond before sending to INFC.

Linda

From: Brown, Tim <Tim.Brown@GOV.NU.CA>
Sent: June 2, 2019 10:14 PM
To: 'Barry Reimer' [redacted] Wells, Dean <Dean.Wells@gov.nu.ca>; Hickey, Ted <Ted.Hickey@gov.nu.ca>; Casson, Linda <LCasson@GOV.NU.CA>
Cc: Woodbury, Grant <GWoodbury@GOV.NU.CA>; Fedyk, Winter <WFedyk@GOV.NU.CA>
Subject: RE: Nunavut Undersea Fibre Optic Cable Project Q&A Table

Hi,

Provided input where I could. Dean and Ted If you could make this a top priority in the morning that would be helpful.

Thanks,

Tim

From: Barry Reimer [redacted]
Sent: June 1, 2019 6:31 PM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>; Wells, Dean <Dean.Wells@gov.nu.ca>; Hickey, Ted <Ted.Hickey@gov.nu.ca>; Casson, Linda <LCasson@GOV.NU.CA>
Cc: Woodbury, Grant <GWoodbury@GOV.NU.CA>; Fedyk, Winter <WFedyk@GOV.NU.CA>
Subject: FW: Nunavut Undersea Fibre Optic Cable Project Q&A Table
Importance: High

Hi all,

I have taken my best shot at drafting responses to most of the questions discussed as discussed on our Friday call, but we still need additional information, review and edits from Dean, Ted, Tim and Linda. Please review and edit based on your individual knowledge and as highlighted in the text.

I can consolidate the individual responses for return to INFC by Linda. If you all try get responses to me on Sunday (it won't actually much time), I will try to get them ready for Linda to send first thing Monday morning. In any case **please issue your responses no later than 11:00 AM Monday morning (sooner if possible)**.

Please cc all with your responses.

Thanks!
Barry

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: May 30, 2019 6:25 PM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>; Casson, Linda <LCasson@GOV.NU.CA>; Barry Reime[redacted]; Wells, Dean <Dean.Wells@gov.nu.ca>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: Nunavut Undersea Fibre Optic Cable Project Q&A Table
Importance: High

Hi all,

We received a long list of questions from our internal review yesterday afternoon, and are able to respond to most of them, but we will need assistance with several – see attached. We are hoping we can get a preliminary signal check on these answers during the call tomorrow, and by **EOD Friday**, we will need answers to these in order to continue to proceed with the project.

[redacted]

Looking forward to our chat tomorrow.

Andrew Antinucci

Program Analyst, Program Operations
Infrastructure Canada / Government of Canada
andrew.antinucci@canada.ca / Tel: 613.946.5192

Analyste des programmes, Opérations des programmes
Infrastructure Canada / Gouvernement du Canada
andrew.antinucci@canada.ca / Tél. : 613.946.5192

Infrastructure Canada
Canada

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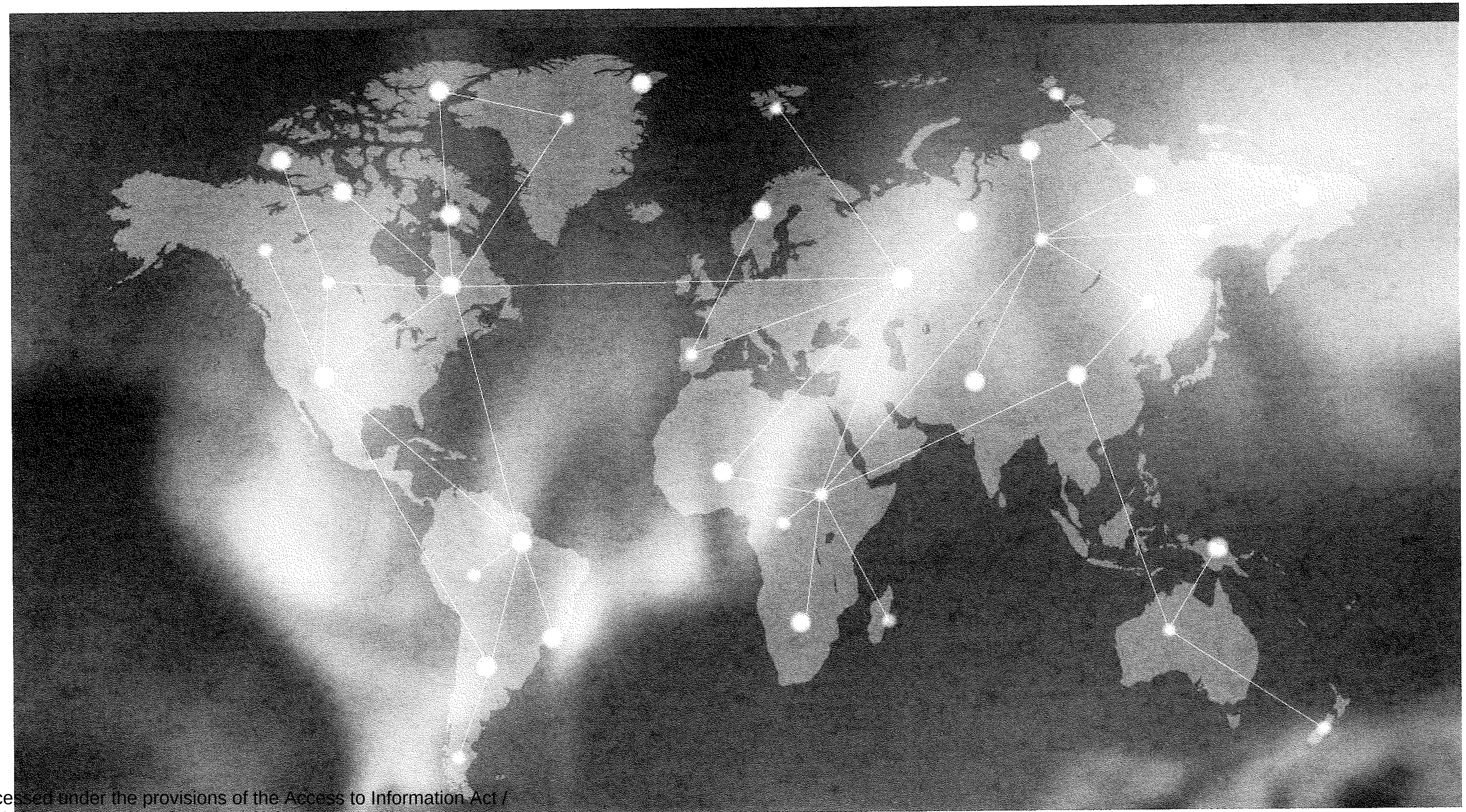
Building *Nunavut* Together
*Nunavu*liuqatigiingniq
Bâtir le *Nunavut* ensemble

Katittuq Nunavut
A Connected Nunavut



Overview

1. Introduction
2. Current Environment
3. Cost of Infrastructure
4. Operating in the North
5. Initiatives & Synergies
6. Priorities

Introduction

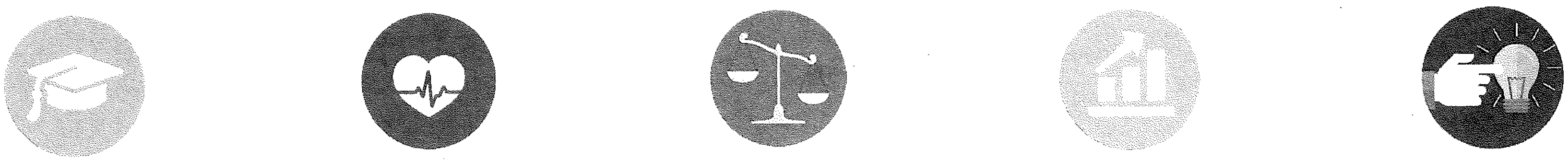
Broadband is the link that ties your community together and connects it to the world. It does not matter if your community is in an urban centre or remote community in northern Canada; high-speed Internet access is the tool that will help your community members and institutions thrive.

The Government of Nunavut is ***committed to:***

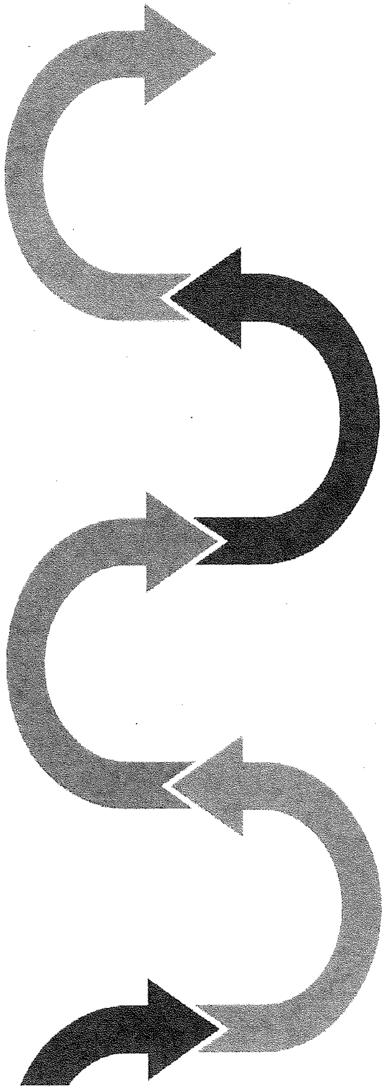
Providing the best possible programs and services for all Government departments and agencies such as Education, Healthcare, Family Services, and Justice. Expansion of our capacity to provide diagnosis and care. An environment where digital X-Rays can diagnose a TB patient immediately in real time.

Low Latency Video conferencing providing opportunities for Nunavummiut to access additional educational and health resources. It also allows Justice & Family services to connect court rooms and family support services across the territory from one remote community to another.

Supporting economic development for Nunavummiut and opportunities for vendors.



Current Situation



All Nunavummiut depends solely on ***satellite for telecommunications*** *(Telesat Anik F2 & F3, & T19V Satellites).*

Nunavut residents currently experience ↓15Mbps ↑ 2Mbps

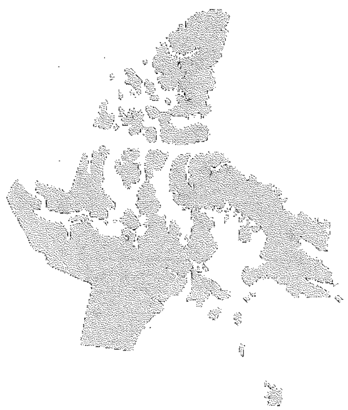
Scaling of Satellite based Telecommunication services in Nunavut is a complex, costly and risky endeavour.

Satellite telecommunications latencies issues hinders the GN ability to benefit from cloud based services. Software developers are moving to an online based licensing and software as a service model.

Iqaluit takes up to 70% *of the Government of Nunavut's current bandwidth.*

Remoteness & Isolation Impacts on Projects

Remoteness *and* Isolation *has a major impact on every aspect of living and conducting business in Nunavut.*
From the very basic fundamentals of food, lodging and travel to the most complex infrastructure projects



Costs of Infrastructure projects

Everything is more expensive than it would in the south

Short Construction Season

Heavily depended on logistics – Lodging, Transport etc.
Very little room to maneuver

Logistics complexity

Sealift – Short navigable season

Airlifts – Limitation and costs, the impact of missing the boat has great impact on any projects

Operating in Nunavut

Operating Telecommunications and IT Services in Nunavut is a complex and costly responsibility that has great impact on every aspect of Nunavummiut's daily lives.

Human Resources

Availability of qualified employees (at what cost?). Working in isolated communities is not for everyone;
Scarcity and affordability of lodging (a very sensitive topic in Nunavut); and
Very high cost of living. (Food, Lodging, Internet & telco services, Travels, Fuel)

Weather

Being dependent on air and sea to bring material, equipment and people adds significant risk to any operation and maintenance response time or projects schedules.
A blizzard has the potential to leave a community without services for days.

Logistics complexity

Remote management capability severely constrained by the Satellite's weaknesses.

- *Latency impacts the ability to keep remote management sessions online*
- *Secured session can't be TCP optimized (accelerated)*

Nunavut Facing Hard Choices

Almost everything must be done and unfortunately we cannot do everything all at once

What to prioritize

- *Budget is limited and the needs are great*

- *Telecommunications are important but so is*
    - ✓ *Housing*
    - ✓ *Clean drinking water*
    - ✓ *Affordable energy*
    - ✓ *Transportation infrastructures*
    - ✓ *Education*

Working with our Neighbors

- The Kativik Regional Government
- Tele-Post - Greenland Connect
- Kivalliq Region Power line project

Telecommunication Projects

- Telesat T19V - High Throughput Satellite
- Low Earth Orbit (LEO) Satellite constellation
- Fibre Project

Undersea Fibre Optic Cable Project

- KRG & the GN conducted marine survey work summer 2018
- Results are being analyzed – understanding risks
- Nunavut Impact Review Board (NIRB) completed
- The GN and the KRG are working together to ensure interconnectivity.

Fiber – The Steps

PHASES

1

Desktop feasibility study

This determines where we can bring the fibre on to land (landing sites) and confirms the ability to construct terrestrial infrastructure to reach those landing sites. The goal is to have minimal impact to traditional hunting and fishing areas as well as a low environmental footprint.

2

Marine Survey

This will help us to determine the best route to lay the cable undersea. Local knowledge on shipping patterns, freezing, melting and year round iceberg flow is invaluable.

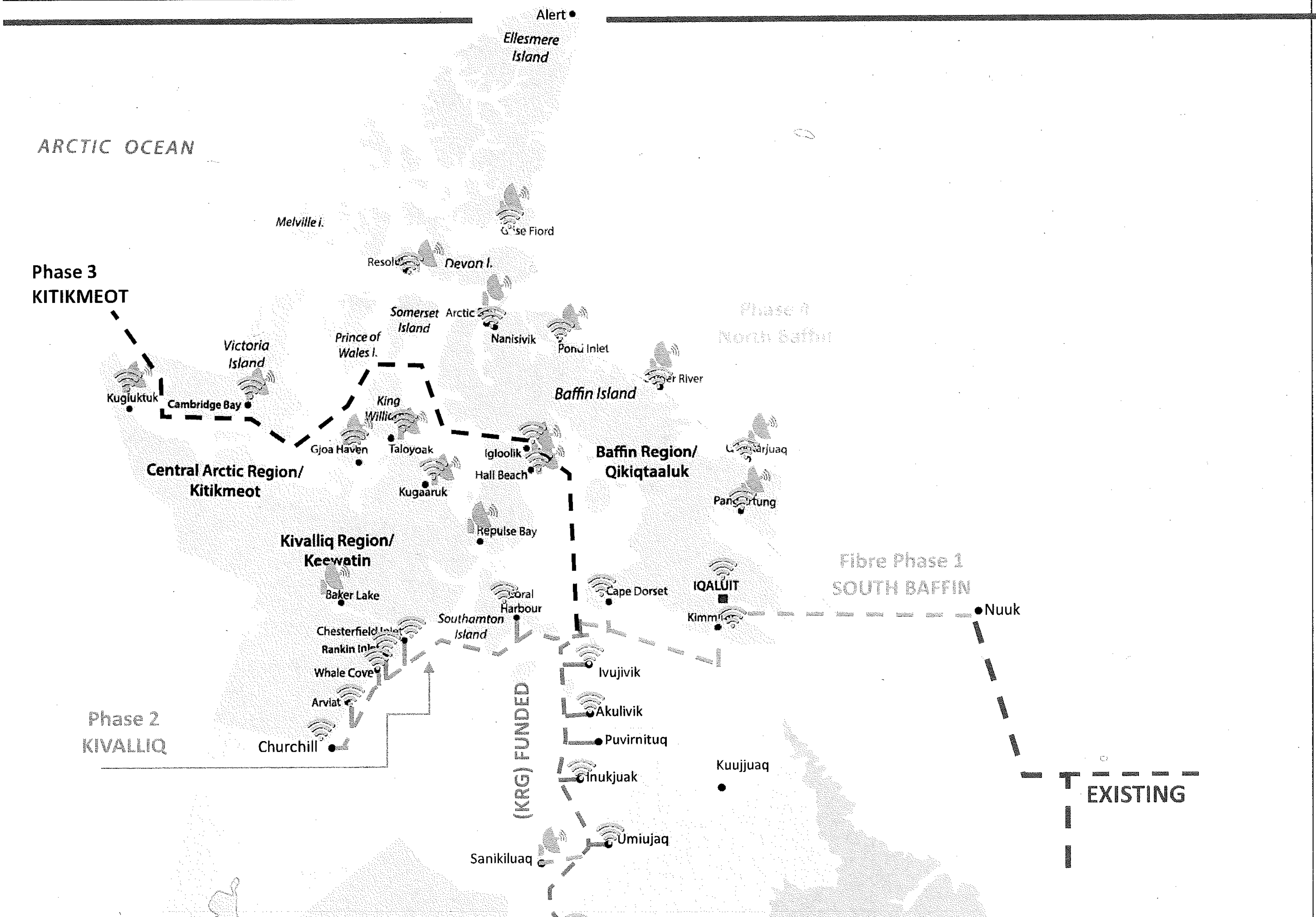
3

Fiber Implementation

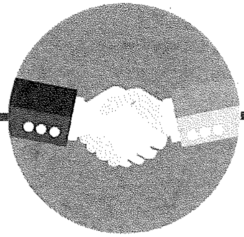
Fiber will be installed under the sea and brought on land to be connected to the existing internet service provider offerings in your community.

The Plan – Phase 4 North Baffin

By adding fibre to one community, we increase the satellite capacity in other communities.



The Plan



LET'S collaborate.

Increasing broadband capacity for all of Nunavut's 25 communities is a priority for the GN & the Federal Government. The GN has committed to contributing $30M towards the fiber initiative, and is currently seeking Federal government funding for this project.

*The GN will collaborate with **Key Stakeholders** to bridge the digital divide for Nunavut.*

How will we do it

Together we will bring various skills sets to the table:

- Negotiation capabilities
- Advocacy & Identifying funding opportunities
- Investment in backbone technology
- Multi-phase approach

The solution will be multi-faceted. There is no one size fits all. Technology Infrastructure may include a blend of:

- F2,F3, and T19V Satellite
- Fiber
- LEO satellites
- Microwave towers

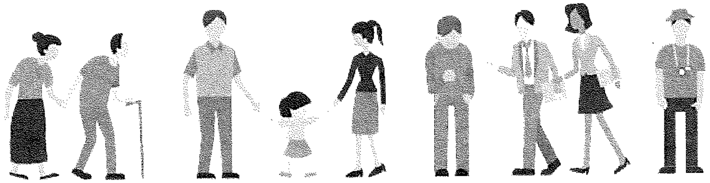
We welcome you to engage with us. Katittuq Nunavut

The Ideal Solution - Mixed satellite and fiber offerings

Bring fiber to as many Nunavut communities as possible

Reallocate capacity on existing satellite infrastructure

Improve access for all Nunavut Communities!



A stronger & prosperous territory with a globally engaged economy, enhanced education programs, and improved public services for all Nunavummiut

Questions

Contact Us

[redacted]

IMIT@gov.nu.ca

A connected Nunavut – A stronger Nunavut

Pages 680-685
are withheld
pursuant to paragraphs
13(1)(c), 14 & 21(1)(b)
of the *Access to Information Act*

****

Les pages 680-685
Font l'objet d'une exception totale
conformément aux dispositions des
paragraphes
13(1)(c), 14 & 21(1)(b)
de la *loi sur l'accès à l'information*

Antinucci, Andrew (INFC)

From:	Brown, Tim <Tim.Brown@GOV.NU.CA>
Sent:	June 4, 2019 1:43 PM
To:	McCallum, Robert (INFC); Casson, Linda
Cc:	Antinucci, Andrew (INFC)
Subject:	RE: Internet coverage

Hi Robert,

We are asking NWTEL what their penetration rate would be for Iqaluit.

There are other providers, but they are the largest.

Tim

Sent with BlackBerry Work
(www.blackberry.com)

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Date: Tuesday, Jun 04, 2019, 12:00
To: Casson, Linda <LCasson@GOV.NU.CA>, Brown, Tim <Tim.Brown@GOV.NU.CA>
Cc: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: Internet coverage

Quick question: do you know what percentage of home in Iqaluit have internet service. We understand the cost is high and as a result the take-up is lower than in other parts of Canada. Wondering if there are any numbers around that.

Robert G. McCallum, P.Eng.
(613) 948-9450
robert.mccallum@canada.ca

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: June 4, 2019 3:32 PM
To: Antinucci, Andrew (INFC)
Subject: RE: IRIS Application

Ok dokey…on it!

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: June 4, 2019 3:30 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: IRIS Application
Importance: High

Hi Linda – I was able to allow you to re-do the IRIS application in order to add the appropriate outcomes, and then subsequently attest to it. Please let me know if you're able to re-submit and then once you've attested the application.

Many thanks!

Andrew

Andrew Antinucci

Program Analyst, Program Operations
Infrastructure Canada / Government of Canada
andrew.antinucci@canada.ca / Tel: 613.946.5192

Analyste des programmes, Opérations des programmes
Infrastructure Canada / Gouvernement du Canada
andrew.antinucci@canada.ca / Tél. : 613.946.5192

Infrastructure Canada

Canada

(5)

ATIA - 19(1)

Trottier-Abbott, Catherine (INFC)

From: Trottier-Abbott, Catherine (INFC)
Sent: June 6, 2019 4:02 PM
To: Casson, Linda
Cc: Passy, Stephen (INFC); Phillips3, Ryan (INFC); Antinucci, Andrew (INFC); McCallum, Robert (INFC); MacQuarrie, Duncan (INFC)
Subject: Re: In Ottawa on July 8th

Hi Linda, I'd love to meet for lunch. I'll send a meeting invite around to help organize us [redacted]

Thanks,
Kate

Sent from my iPhone

On Jun 6, 2019, at 3:27 PM, Casson, Linda <LCasson@GOV.NU.CA> wrote:

Good day, esteemed INFC colleagues

I will be in Ottawa on July 8 and would love to be able to meet. I believe Stephen was considering arranging an Oversight Committee meeting, and it would be wonderful to at least meet Andrew and Robert in person, even just for a few minutes to shake hands.

Perhaps, if your day is too full, we could least arrange lunch?

Once we have a time for the Oversight Committee meeting, I will rope in some Nunavut colleagues by phone.

All the best and looking forward to this!

Qujannamiik/Merci/Thank You

Linda Casson

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Manager, Infrastructure Programs
Department of Community and
Government Services
Government of Nunavut

Atanguyaq, Nunalaaniituni
Tunngavikhaliqiyunut
Nunalingni Kavamatkunnilu
Pivikhaqautikkut
Nunavut Kavamanga

Gestionnaire, programmes d'infrastru
Ministère des Services communautair
gouvernementaux,
Gouvernement du Nunavut

☎ 867-975-5336
✉ lcasson@gov.nu.ca

Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

6

ATIA - 13(1)(c)

ATIA - 14

ATIA - 19(1)

ATIA - 21(1)(b)

Antinucci, Andrew (INFC)

From:	Antinucci, Andrew (INFC)
Sent:	June 10, 2019 4:25 PM
To:	'Barry Reimer'
Cc:	'Brown, Tim'; McCallum, Robert (INFC); 'Casson, Linda'
Subject:	RE: Urgent Info Required
Importance:	High

[redacted]

Andrew

From: Barry Reimer [mailto[redacted]]
Sent: June 10, 2019 4:06 PM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Cc: 'Brown, Tim' <Tim.Brown@GOV.NU.CA>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; 'Casson, Linda' <LCasson@GOV.NU.CA>
Subject: RE: Urgent Info Required

Hi Andrew,

[redacted]

Barry

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: June 10, 2019 12:30 PM
To: Barry Reimer <[redacted]
Cc: 'Brown, Tim' <Tim.Brown@GOV.NU.CA>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; 'Casson, Linda' <LCasson@GOV.NU.CA>
Subject: RE: Urgent Info Required
Importance: High

Hi Barry,

[redacted]

ATIA - 13(1)(c)

ATIA - 14

ATIA - 19(1)

ATIA - 21(1)(b)

Let me know if this makes sense – happy to chat further.

From: Barry Reimer [mailto[redacted]
Sent: June 10, 2019 2:53 PM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Cc: 'Brown, Tim' <Tim.Brown@GOV.NU.CA>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; 'Casson, Linda' <LCasson@GOV.NU.CA>
Subject: RE: Urgent Info Required

Hi Andrew,

[redacted]

Barry

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: June 10, 2019 11:05 AM
To: Barry Reimer [redacted]
Cc: 'Brown, Tim' <Tim.Brown@GOV.NU.CA>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; 'Casson, Linda' <LCasson@GOV.NU.CA>
Subject: RE: Urgent Info Required
Importance: High

Hi Barry – [redacted]

Andrew

From: Barry Reimer [mailto[redacted]
Sent: June 10, 2019 1:52 PM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Cc: 'Brown, Tim' <Tim.Brown@GOV.NU.CA>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>; 'Casson, Linda' <LCasson@GOV.NU.CA>
Subject: RE: Urgent Info Required

Hi Andrew,

[redacted] Not sure how you want to format the information, so just left it in Excel.
Please let us know if you need anything else.

Regards,
Barry

ATIA - 13(1)(c)
ATIA - 14
ATIA - 19(1)
ATIA - 21(1)(b)

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: June 10, 2019 9:05 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: Brown, Tim <Tim.Brown@GOV.NU.CA>; 'Barry Reimer' [redacted]>; McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: RE: Urgent Info Required
Importance: High

Hi Linda – [redacted] Can that be provided in short order?

Andrew

From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: June 10, 2019 12:03 PM
To: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Cc: Brown, Tim <Tim.Brown@GOV.NU.CA>; 'Barry Reimer' <[redacted]
Subject: RE: Urgent Info Required

HI ANDREW

[redacted]

Please let us know if you need anything else.

Linda

From: Barry Reimer [redacted]
Sent: June 10, 2019 11:38 AM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: Brown, Tim <Tim.Brown@GOV.NU.CA>
Subject: Re: Urgent Info Required

[redacted] Will confirm when I get back to my office.

Barry
[redacted]

ATIA - 14

ATIA - 19(1)

On Jun 10, 2019, at 8:34 AM, Casson, Linda <LCasson@gov.nu.ca> wrote:

ATIA - 21(1)(b)

Hi Barry
This is the content in the application if that is useful
<image004.jpg>

From: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Sent: June 10, 2019 11:14 AM
To: Casson, Linda <LCasson@GOV.NU.CA>; Brown, Tim <Tim.Brown@GOV.NU.CA>; 'Barry Reimer'
[redacted]
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Subject: Urgent Info Required
Importance: High

Hi all,

[redacted]

Let me know if you could provide this information by **2:30pm today.**

We are happy to set up a call if needed to further discuss.

Andrew

Andrew Antinucci

Program Analyst, Program Operations
Infrastructure Canada / Government of Canada
andrew.antinucci@canada.ca / Tel: 613.946.5192

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Infrastructure Canada / Gouvernement du Canada
andrew.antinucci@canada.ca / Tél. : 613.946.5192

Infrastructure Canada

Canada

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: July 4, 2019 3:43 PM
To: McCallum, Robert (INFC); Passy, Stephen (INFC)
Cc: MacQuarrie, Duncan (INFC); Antinucci, Andrew (INFC)
Subject: RE: [PLACEHOLDER] Linda in Ottawa. NU Fibre Discussion

Sounds wonderful.
May need joining information so we can bring other NU staff into the conversation

Linda Casson
Community Infrastructure Division
Community and Government Services
Government of Nunavut
Phone: 867.975.5336

From: McCallum, Robert (INFC) [robert.mccallum@canada.ca]
Sent: July 3, 2019 3:26 PM
To: Passy, Stephen (INFC); Casson, Linda
Cc: MacQuarrie, Duncan (INFC); Antinucci, Andrew (INFC)
Subject: RE: [PLACEHOLDER] Linda in Ottawa. NU Fibre Discussion

Yes, I envisioned an informal discussion. I thought we could go through the anticipated approval conditions, especially the things you'll need to work on to clear those conditions (so the money can start to flow). We received a lot of questions on the project, and we want to explain what those were and how we handled them.

Rob

-----Original Message-----
From: Passy, Stephen (INFC)
Sent: July 3, 2019 2:09 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: McCallum, Robert (INFC) <robert.mccallum@canada.ca>; MacQuarrie, Duncan (INFC) <duncan.macquarrie@canada.ca>
Subject: RE: [PLACEHOLDER] Linda in Ottawa. NU Fibre Discussion

I can. I am not sure that Rob is not entirely clear on what you are hoping to discuss at the Fiber meeting. Perhaps he is. I have cc'd him so he can correct me if need be. I was under the impression that you, he and Andrew were having somewhat of an informal discussion on fibre and that there would be no need for joining info.

If there is a need for a conference line we will add it into the invite.

For the OC meeting, a conference line will be provided, as will an agenda. Those items will come later today or tomorrow.

Stephen

Stephen Passy
Manager, North

Program Operations Branch
North/Atlantic/Ontario Directorate
Infrastructure Canada /Government of Canada
Tel: 613-960-6790

Gestionnaire, Nord
Opérations des programmes
Direction générale du Nord/Atlantique/Ontario Infrastructure Canada / Gouvernement du Canada
Tél: 613-960-6790

-----Original Message-----
From: Casson, Linda [mailto:LCasson@GOV.NU.CA]
Sent: July 3, 2019 1:10 PM
To: Passy, Stephen (INFC) <stephen.passy@canada.ca>
Subject: RE: [PLACEHOLDER] Linda in Ottawa. NU Fibre Discussion

Hi Stephen
Are you including the joining information on the agenda?

Cheers

Linda Casson
Community Infrastructure Division
Community and Government Services
Government of Nunavut
Phone: 867.975.5336

From: Passy, Stephen (INFC) [stephen.passy@canada.ca]
Sent: June 30, 2019 5:24 PM
To: McCallum, Robert (INFC); Antinucci, Andrew (INFC); Casson, Linda
Subject: [PLACEHOLDER] Linda in Ottawa. NU Fibre Discussion
When: August 8, 2019 10:30 AM-12:00 PM.
Where: INFC CONF Ott-180Kent-09-001 CONF INFC

Note, I've booked an 90 minutes. Rob/Linda, if you will not need this amount of time, we can adjust.

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: July 11, 2019 5:07 PM
To: McCallum, Robert (INFC); Antinucci, Andrew (INFC)
Cc: Brown, Tim; Woodbury, Grant; 'Barry Reimer'
Subject: New information

Hi Robert and Andrew
It was a pleasure to meet you in person and I thank you for making the time to meet with me.

Just as a heads up, we have been advised that KRG did not receive any compliant bids in response to their fibre project tender that closed on June 12 . We understand that they intend to issue a revised tender in the near future. We will continue to send you any information as this becomes available.

Best regards

Qujannamiik/Merci/Thank You

Linda Casson

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Manager, Infrastructure Programs
Department of Community and Government Services
Government of Nunavut

Atanguyaq, Nunalaaniituni Tunngavikhaliqiyunut
Nunalingni Kavamatkunnilu Pivikhaqautikkut
Nunavut Kavamanga

Gestionnaire, programmes d'Infrastructure
Ministère des Services communautaires et gouvernementaux,
Gouvernement du Nunavut

☎ 867-975-5336
✉ lcasson@gov.nu.ca
Box 1000, Station 700 (4th Floor, Brown Building) Iqaluit, NU X0A 0H0

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: July 16, 2019 10:14 AM
To: McCallum, Robert (INFC); Antinucci, Andrew (INFC); Trottier-Abbott, Catherine (INFC)
Cc: 'Barry Reimer'
Subject: FW: Permitting Matrix
Attachments: Permits and Licences Matrix_20190620.xlsx

Hi Robert and Andrew
Barry had forwarded this in advance of our meeting but I missed getting it to you. We will continue to forward info as it filters in.

Linda

From: Barry Reimer [redacted]
Sent: June 27, 2019 5:26 PM
To: Casson, Linda <LCasson@GOV.NU.CA>; Linda Casson <casson@live.ca>
Subject: Permitting Matrix

Hi Linda,

[redacted] Just forwarding a coping of the current permitting matrix as you requested in the event of a meeting with the INFC environmental team in Ottawa.

Regards,
Barry

Barry Reimer, [redacted]
ᐱᐅᕆ ᕆᒪ
Project Director, Katittuq Nunavut
(Greenland-Nunavut Undersea Fibre Project)
M: [redacted]

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Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: July 30, 2019 10:41 AM
To: McCallum, Robert (INFC); Antinucci, Andrew (INFC)
Subject: Nunavut fibre project

Hi gentlemen
Any news?

thanks

Qujannamiik/Merci/Thank You

Linda Casson

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Manager, Infrastructure Programs
Department of Community and Government Services
Government of Nunavut

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Antinucci, Andrew (INFC)

From:	Brown, Tim <Tim.Brown@GOV.NU.CA>
Sent:	September 18, 2019 3:29 PM
To:	McCallum, Robert (INFC); Casson, Linda
Cc:	Nassif, Marie-Pier (INFC); Antinucci, Andrew (INFC); Passy, Stephen (INFC); Pichette, Chanelle (INFC)
Subject:	RE: Nunavut Broadband Project - Next Steps
Attachments:	Nunavut Undersea Fibre Project QA 20190918v2.docx

Hi,

Thanks for the meeting. Please find attached a revised table based on our discussion.

Tim

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: September 10, 2019 1:24 PM
To: Brown, Tim <Tim.Brown@GOV.NU.CA>; Casson, Linda <LCasson@GOV.NU.CA>
Cc: Nassif, Marie-Pier (INFC) <marie-pier.nassif@canada.ca>; Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>; Passy, Stephen (INFC) <stephen.passy@canada.ca>; Pichette, Chanelle (INFC) <chanelle.pichette@canada.ca>
Subject: RE: Nunavut Broadband Project - Next Steps

Hi Tim

I did not get a response to this email, and just wanted to make sure you received it. At the very bottom of this email we suggested that we have a teleconference to discuss the conditions early this week. Tomorrow morning is still available, if that works for you. Note that I'll be away from the office Thursday-Friday, so if not tomorrow it would need to wait until next week.

Next week, it could be:

Tuesday Sept 17	11:00-12:00
Wednesday Sept 18	13:00-14:00
Thursday Sept 19	11:00-12:00

Rob

From: McCallum, Robert (INFC)
Sent: September 6, 2019 2:11 PM
To: Tim Brown <Tim.Brown@GOV.NU.CA>; Linda Casson <LCasson@GOV.NU.CA>
Cc: Marie-Pier Nassif (INFC) (marie-pier.nassif@canada.ca) <marie-pier.nassif@canada.ca>; INFC|INFC (andrew.antinucci@canada.ca) <andrew.antinucci@canada.ca>; Passy, Stephen (INFC) <stephen.passy@canada.ca>; Phillips3, Ryan (INFC) <ryan.phillips3@canada.ca>; Chanelle Pichette (INFC) (chanelle.pichette@canada.ca) <chanelle.pichette@canada.ca>
Subject: Nunavut Broadband Project - Next Steps

Hi Tim and Linda

ATIA - 13(1)(c)

ATIA - 14

ATIA - 21(1)(b)

Further to our conversation with Linda on July 8, and the recent federal approval of the project, I would like to detail some of the key points we'll need to jointly work on over next six months or so.

With approval, the project will now transition back to Stephen Passy's team, with Ryan Phillips serving as your main contact. Andrew and I will be available to advise and assist Stephen and Ryan as required [redacted] Marie-Pier remains as the director overseeing this project.

Project Scope

[redacted]

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ATIA - 13(1)(c)
ATIA - 14
ATIA - 21(1)(b)

[redacted]

In terms of next steps, we'd like to have a teleconference with you next week to discuss the approval letter, this email, and next steps. Here are several suggested times:

Tuesday September 10	11:00-12:00
"	14:30-15:30
Wednesday September 11	10:00-11:00

Please let us know if one of these works for you, and who you would like to extend the invitation to.

Thanks,

Robert G. McCallum, P.Eng.
Chief Engineer, Ontario
(613) 948-9450
robert.mccallum@canada.ca

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Questions and Answers - Nunavut Fibre Project and Satellite Benefits

Q. What are the details of this project, and how much will it cost?

- The Project consists of the installation of 1,700 km of submarine fibre optic cable across the Davis Strait from Nuuk, Greenland to Iqaluit, Nunavut with an extension to Kimmirut.

- The Project aims to address the fact that Nunavut is the only province/territory in Canada without access to a fibre optic network, and is therefore completely dependent on satellite for its communication backbone.

- This lack of optic fibre results in slow download speeds, with a maximum download speed under 15 megabits per second (Mbps) for residential internet services – a number far below the government's universal connectivity target of 50 megabits (Mbps) per second download and 10 Mbps upload ("50/10").

- As a result of this Project, the communities of Kimmirut and Iqaluit, which account for approximately 3215 households in Nunavut, will be able to access high-speed Internet services that meet the 50/10 connectivity target, as well as faster speeds, including up to 1,000 megabits per second (subject to completion of "last-mile" infrastructure).

- [redacted]

Total Eligible Costs	$201,617,753
ICIP Contribution – Rural and Northern Communities (75% of total eligible costs)	$151,213,315
Territorial Contribution to Eligible Costs (Government of Nunavut)	$50,404,438

Q. How many households and businesses will benefit from this project?

- Approximately 3,215 households will be able to access high-speed internet services upon project completion (subject to completion of "last-mile" infrastructure).

- In addition, the project is expected to improve internet service to local businesses and entrepreneurs, as well as public institutions such as schools, medical facilities and government offices.

- The improved speeds and service quality as a result of fibre connection will facilitate the use of advanced applications such as distance education, remote healthcare, and high definition videoconferencing.

Q. What will this project mean for other NU communities?

- Iqaluit is the most populous community in Nunavut and, like all 25 communities in the territory, it is currently entirely satellite-dependent. Iqaluit and Kimmirut use a significant portion of the satellite bandwidth that is available for the entire territory.
- Once Iqaluit and Kimmirut move to fibre, it will free-up considerable satellite capacity for the rest of Nunavut, resulting in faster internet services for other communities.
- In the medium-term, planned federal investments in new satellite solutions will also have a substantial improvement for the other Nunavut communities.

Q. Is this the best use of Nunavut's full allocation under the Rural and Northern Stream?

- Under the Investing in Canada Infrastructure Program, the Government of Canada works closely with provincial, territorial and municipal partners to fund infrastructure projects. However, these orders of government are responsible for the planning, prioritization, design, financing and operation of their infrastructure assets.
- As such, the Government of Nunavut prioritized and nominated this project under the Rural and Northern Communities Infrastructure stream, as it believes this project is transformative for the territory.
- The Government of Canada is investing $2 billion in infrastructure in rural and northern communities over 10 years. By improving broadband Internet connectivity, this investment helps set the conditions for social inclusivity and create more economic opportunities in Canada's northern and rural communities.
- The Rural & Northern Communities Stream is just one stream of the $180 billion Investing in Canada Plan. Nunavut is still able to prioritize additional infrastructure projects through other streams, including for projects promoting green and social infrastructure.

Q. What companies have been selected to work on this project?

- Companies have not yet been selected.
- [redacted]

Q. What are the timelines for completing this project?

- [redacted]

Q. How will this project benefit anchor institutions?

- The project will provide greater connectivity to everyone in Iqaluit and Kimmirut, including not just households but local businesses and entrepreneurs, schools, medical facilities and government offices.

Q. How does this project align with the government's connectivity strategy?

- The Nunavut Fibre project is in alignment with the government's recently launched Connectivity Strategy.
- In particular:
  - It aligns with the Government's 50/10 target.
  - It supports scalability and long-term growth of data traffic beyond the 50/10 target, including up to 1000 Mbps (also referred to as 1 Gigabit per second).
  - It improves service resiliency and reliability.
  - The Strategy notes that it will be necessary to leverage a mix of technologies including fibre, fixed wireless, and satellite to achieve these objectives.
  - The Strategy also notes the total costs to connect underserved regions is in the order of $8 billion, and will need a range of different partnerships. This includes funding from federal programs (e.g., from Innovation, Science and Economic Development Canada, Infrastructure Canada, CRTC), other levels of government, and the private sector.

Q. Is this project really needed? Isn't the government going to connect the north with Telesat's low-Earth orbit (LEO) satellite constellation?

- The government's recently announced LEO satellite initiative and this fibre project are complementary. They are both part of the government's broader programming to connect all Canadians.
- A mix of technologies will be required to reach the universal target in Canada's connectivity strategy. This includes both fibre and satellite, including in the north.
- For larger communities such as Iqaluit, fibre is able to provide access to enough broadband capacity, comparable to urban areas in the south. It is also scalable as demand grows over time.

- LEO satellite technology has an important role to play. It can help connect more difficult-to-reach communities in rural and remote areas across Canada.

- Having both fibre and satellite in the region can also improve network resiliency by having a back-up option.

Q. But I thought LEO constellations would have global coverage. Is that not true?

- LEO constellations will have broad coverage, but they still have a finite amount of capacity.

- That's why the government recognizes there is a mix of technologies that will play a role in connecting Canadians as part of it's connectivity strategy, including both fibre and satellite solutions.

Q. The Nunavut fibre project is only for backbone. What about the "last-mile" connecting households?

- Nunavut communities are extremely remote and the main cost of delivering service is the backbone link connecting the community to the outside world. This can be in the order of 80-90% of the capital costs.

- The backbone is the main bottleneck to offering faster speeds.

- The local "last mile" network within these communities is much easier because homes are compactly distributed.

- Nunavut intends to sell access to the fibre to local Internet Service Providers (ISPs), who will complete last-mile connections to households (or upgrade their existing networks) and then sell internet access to end users.

Q. Minister Bains announced $600 million for satellite capacity. What was that paying for? How does it relate to Strategic Innovation Fund (SIF) funding?

- Budget 2019 announced several initiatives to expand high-speed Internet to Canadians, including funding to secure capacity on a LEO constellation for the provision of services.

- Consistent with Budget 2019, the Memorandum of Understanding announced by Minister Bains in July is to secure satellite capacity from Telesat's planned LEO constellation, which will serve Canada's more challenging remote areas. The

Government intends to commit up to $600 million over 10 years to secure this capacity, subject to reaching definitive terms of a contribution agreement.

- In addition, the Government announced $85 million from the Strategic Innovation Fund to help develop and commercialize aspects of Telesat's constellation. This stems from $100 million announced in Budget 2018 to help develop next generation satellites including LEO constellations.

Q. This seems like a lot of money for the north. Why is it so expensive?

- As recognised in the Connectivity Strategy, providing universal access at 50/10 speeds is an ambitious undertaking.

- The total costs to provide universal high-speed access in underserved rural and remote communities are in the order of $8 billion. This includes federal programs, other levels of government, and the private sector. These services are essential for all Canadians to participate in the modern economy and society.

Antinucci, Andrew (INFC)

From: Casson, Linda <LCasson@GOV.NU.CA>
Sent: October 1, 2019 10:55 AM
To: McCallum, Robert (INFC)
Cc: Antinucci, Andrew (INFC)
Subject: RE: Is Tim back?

Hello gentlemen
[redacted] so please let me know if there is anything that you need me to work on.

Best regards

Linda

From: McCallum, Robert (INFC) <robert.mccallum@canada.ca>
Sent: August 21, 2019 3:18 PM
To: Casson, Linda <LCasson@GOV.NU.CA>
Cc: Antinucci, Andrew (INFC) <andrew.antinucci@canada.ca>
Subject: Is Tim back?

Hi Linda

[redacted] We'd like to schedule a call to discuss the approval and next steps. [redacted] so ideally we would have the call this week.

Thanks,

Robert G. McCallum, P.Eng.
Chief Engineer, Ontario
(613) 948-9450
robert.mccallum@canada.ca

Infrastructure Canada

PROTECTED B

BRIEFING NOTE TO THE DEPUTY MINISTER

UPDATE ON GOVERNMENT OF NUNAVUT'S UNDERSEA FIBRE OPTIC CABLE INSTALLATION LINKING GREENLAND, NUNAVUT AND QUEBEC

(For Information)

PURPOSE

- To provide an update on the status of Nunavut's Undersea Fibre Optic Cable Project (the Project) submitted under the Rural and Northern Communities Infrastructure stream of the Investing in Canada Infrastructure Program (ICIP).

HIGHLIGHTS/KEY CONSIDERATIONS

- Infrastructure Canada (INFC) officials are working with the Government of Nunavut (GN) staff [redacted] GN has recently hired a project manager to coordinate ongoing project activities and assist with finalising the business case.

- In November 2018 GN increased the total project cost from $120 million to $140 million, with a corresponding increase in the requested federal funding under ICIP from $90 million to $105 million (representing 75% of eligible costs).

- [redacted]

- The project requires a determination under Section 67 of the *Canadian Environmental Assessment Act, 2012*. Innovation, Science and Economic Development (ISED) is responsible for this determination and will rely on the territorial Environmental Assessment (EA) being undertaken on this project to satisfy federal Section 67 requirements. A decision regarding the territorial EA is anticipated in early March 2019. [redacted]

- [redacted]

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KEY BACKGROUND

- Nunavut has an allocation of $158,660,579 available for projects under the Rural and Northern Communities Infrastructure stream of ICIP, which includes projects related to broadband.

- The "Undersea Fibre Optic Cable Installation Linking Greenland, Nunavut and Quebec" was formally submitted to INFC on November 1, 2018. An initial business case was submitted at that time and revised in December 2018.

- The project proposes to construct an underwater fibre-optic broadband backbone in order to connect Nunavut to the Eastern Arctic Undersea Fibre Optic Cable Network located in Greenland, providing the opportunity to increase internet speeds throughout Nunavut once end users will be connected – which will bring it in line with the requirements of the Canadian Radio-television and Telecommunications Commission (CRTC).

- The project seeks to address existing connectivity and bandwidth issues as the CRTC has ruled that internet access to broadband speeds of 50 megabits per second (Mbps) is an essential service, and Nunavut's current maximum download speeds remain under 15 Mbps. The current speeds negatively affects the delivery of service within GN departments as well as in communities across the territory.

- [redacted]

RECOMMENDATIONS/NEXT STEPS

- INFC officials will continue to work with GN [redacted]

- [redacted]

Marc Fortin Assistant Deputy Minister Program Operations Branch	Date

Attachment:

Annex A - Undersea Fibre Optic Cable Installation Linking Greenland, Nunavut and Quebec – Proposed Cable Route (Draft)

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ATIA - 21(1)(a)

ATIA - 21(1)(b)

Infrastructure Canada

PROTECTED B ATIA - 69(1)(g) - (a)

ATIA - 69(1)(g) - (c)

BRIEFING NOTE TO THE DEPUTY MINISTER

NUNAVUT UNDERSEA FIBRE OPTIC CABLE PROJECT

(For Information)

PURPOSE

- This note seeks a decision as to whether approval of the Nunavut Undersea Fibre Optic Cable Project (the Project), [redacted]

HIGHLIGHTS/KEY CONSIDERATIONS

- [redacted]

- [redacted]

- [redacted]

- A recent change to ICIP's Terms and Conditions allows for the funding of planning studies, which would enable Nunavut – once the amended Integrated Bilateral Agreement will be executed – to continue project development (including preparation of the Request for Proposals for the Design-Build contract) using federal funds. [redacted]

PROTECTED B

KEY BACKGROUND

- The Project is a proposed undersea fibre optic cable linking the communities of Iqaluit and Kimmirut to Greenland. The Project will enable the provision of Broadband service in accordance with the 2017 Canadian Radio and Television Commission (CRTC) ruling that high speed broadband is an essential service.

- The Project is a result of a joint study undertaken in 2016-17 by the Governments of Nunavut, Nunavik, and Nunatsiavut, which led to a proposal for an undersea fibre optic network serving the eastern Canadian Arctic, called the Eastern Arctic Undersea Fibre Optic Network (EAUFON).

- The EAUFON is being developed in phases. The Kativik Regional Government (KRG) was successful in securing funding under Innovation Science and Economic Development's (ISED) *Connect to Innovate* Program in 2017, for undersea fibre along the east coast of Hudson Bay. The KRG project is currently out to tender and expected to start construction later this year.

- Nunavut applied for funding under ICIP in 2018 for its portion of the EAUFON, initially seeking federal funding for $90 million of the Project's $120 million cost. In late 2018 Nunavut increased the budget to $140 million and the requested federal share to $105 million. [redacted]

- On April 3, 2019 Program Operations received an updated Business Case for the Project, [redacted] The Business Case and supporting documents have been reviewed and a summary is provided in Annex A. The key points are:
    - [redacted]
    - [redacted]

[redacted]

- In February 2019 the Terms and Conditions for ICIP were changed to allow Provinces and Territories to allocate funds to planning of projects in support of eventual construction. [redacted]

[redacted]

RECOMMENDATION/NEXT STEPS

- [redacted]

Marc Fortin Assistant Deputy Minister Program Operations Branch	Date

Attachment:

Annex A - Nunavut Undersea Fibre Optic Cable Project - Business Case Analysis

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ATIA - 21(1)(b)

Annex A

Nunavut Undersea Fibre Optic Cable Project - Business Case Analysis

Project Summary

The Government of Nunavut's Undersea Fibre Optic Cable Installation Linking Greenland and Nunavut will provide an undersea fibre optic cable to the communities of Iqaluit and Kimmirut on Baffin Island, by linking to existing networks in Nuuk, Greenland. The project will enable high-speed broadband internet service to be provided to these communities [redacted] The cable will terminate in the two communities; completion of the local "last mile" distribution network will be the responsibility of Internet Service Providers who will contract with Nunavut to deliver internet service when construction is completed.

The project includes optional scope elements that would expand service to additional communities and provide service redundancy. These elements will be added if bid prices permit.

Key Points of Business Case

Project Management

[redacted]

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WebCIMS #:
Date created: July 24, 2019
Prepared by: Andrew Antinucci

ATIA - 21(1)(b)

PROTECTED B

ATIA - 69(1)(g) - (a)

ATIA - 69(1)(g) - (c)

BRIEFING NOTE TO THE DEPUTY MINISTER

DEPUTY MINISTER BRIEFING ON NUNAVUT UNDERSEA FIBRE OPTIC CABLE PROJECT

(For Information)

PURPOSE

- The purpose of this note is to provide background regarding the Nunavut Undersea Fibre Optic Cable Project in advance of your meeting on July 29, 2019, with the Deputy Minister of Innovation, Science and Economic Development (ISED), the Associate Secretary at Treasury Board Secretariat, and senior representatives from Government Affairs Canada.

HIGHLIGHTS/KEY CONSIDERATIONS

- [redacted]

- The Project is a key component of Nunavut's broadband strategy, and will enable the provision of high speed internet access to the communities of Iqaluit and Kimmirut, consistent with the Canadian Radio-Television and Telecommunications Commission's ruling that access to broadband speeds of 50/10 Mbps is an essential service.

- Nunavut envisions further improvements in broadband service to its more remote areas via redeployment of satellite capacity currently used by Iqaluit and Kimmirut, and by means of access to new satellites expected to come into service in the coming years.

- One promising satellite technology to serve remote areas is Low Earth Orbit (LEO) satellites. On July 24, 2019, ISED Minister Bains announced the signing of a Memorandum of Understanding with Telesat to secure broadband capacity from its planned LEO satellite constellation, with a government contribution of up to $600 million. [redacted] Minister Bains also announced $85 million for Telesat to test new technologies for its LEOs under ISED's Strategic Innovation Fund (SIF). [redacted]

- [redacted]

WebCIMS #:
Date created: July 24, 2019
Prepared by: Andrew Antinucci

ATIA - 21(1)(b)

PROTECTED B ATIA - 69(1)(g) - (a)

[redacted]

- The two technologies are complementary. There is limited satellite capacity, and this will still be the case with new and improved LEO satellites. For large communities such as Iqaluit, fibre is more cost effective than satellite over the long-term, and is much more scalable than satellite, enabling faster speeds and accommodating more demanding applications. In addition, the completion of these two projects will improve service resiliency in Iqaluit. In the event of a fibre cut, satellite connectivity would act as a back-up, and if there is a satellite outage due to weather or other factors, Iqaluit would have the benefit of the fibre cable. [redacted]

- Of note, there is an adjacent broadband fibre project intended to provide service to communities along the Hudson Bay coast of Quebec, with the Kativik Regional Government (KRG) as the proponent. The project is being jointly funded by ISED under the Connect to Innovate program ($62.6 million) and the Government of Quebec ($62.6 million) with a small ($0.5 million) contribution from KRG. [redacted]

- [redacted]

KEY BACKGROUND

- In June 2019, the Government of Nunavut submitted the project for federal approval under the Investing in Canada Infrastructure Program (ICIP) – Rural and Northern Communities Infrastructure Stream (RNIS). The project will use the Government of Nunavut's entire RNIS allocation under ICIP.

[redacted]

WebCIMS #:
Date created: July 24, 2019
Prepared by: Andrew Antinucci

ATIA - 14

ATIA - 21(1)(b)

PROTECTED B

ATIA - 69(1)(g) - (a)

ATIA - 69(1)(g) - (c)

[redacted]

- [redacted]
- The Project consists of the installation of 1,700 km of submarine fibre optic cable across the Davis Strait from Nuuk, Greenland to Iqaluit, Nunavut with an extension to Kimmirut. As a result of this Project, the communities of Kimmirut and Iqaluit, accounting for 3215 households in Nunavut, will have access to high speed internet services of 1 gigabyte per second, subject to completion of "last-mile" infrastructure.
- [redacted]
- [redacted]

NEXT STEPS

- Proceed with the meeting and continue to work towards [redacted]

Marc Fortin
Assistant Deputy Minister
Program Operations Branch

Date

Minister of Rural Economic Development

Ministre du Développement économique rural

Ottawa, Canada K1P 0B6

The Honourable Lorne Kusugak
Minister of Community and Government Services
Minister of Human Resources
Government of Nunavut
P.O. Box 2410
Iqaluit, Nunavut X0A 0H0

AUG 1 6 2019

Dear Colleague:

It is my pleasure to inform you of the approval of the Government of Nunavut's Undersea Fibre Optic Cable Project under the *Canada-Nunavut Integrated Bilateral Agreement for the Investing in Canada Infrastructure Program* (the Agreement).

You will find enclosed a project list that includes details about the approved project, which is governed by the terms and conditions of the Agreement. The maximum federal funding for the project under the Investing in Canada Infrastructure Program is the percentage of total eligible costs up to the maximum funding amount indicated in the enclosed list (columns G and H respectively).

In order for Canada to pay eligible costs for the approved project, all requirements outlined in the Agreement must be met. As a reminder, to be considered eligible, costs must be incurred on or after the date of this letter and costs must be associated with contracts signed on or after the date of this letter, except for costs associated with completing climate lens assessments and costs associated with Aboriginal consultation and engagement activities, which are retroactively eligible from February 15, 2018. In addition, Canada will not be financially responsible for any ineligible expenditures or cost overruns for this project.

Environmental Assessment

Canada has determined that there are potential requirements under Section 67 of the *Canadian Environmental Assessment Act, 2012* for this Project. No site preparation, vegetation removal or construction can occur and Canada will not pay eligible capital costs until federal environmental assessment requirements as outlined in the Agreement are met and continue to be met, when applicable as determined by Canada. A letter specifying requirements will follow. Given that the Impact Assessment Act (IAA) received royal assent on June 21, 2019, it is possible new requirements could arise for the project under this new legislation. If applicable, INFC will ensure to communicate to the Government of Nunavut any additional requirements once the IAA is in force.

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Aboriginal Consultation

Canada has determined there is a legal obligation to consult with Aboriginal groups under section 35 of the *Constitution Act, 1982* for this Project, but consultation requirements have been met through the Territorial Environmental Assessment process. No additional consultation activities are required at this time.

Other Payment Conditions

The following additional conditions must be met for Canada to pay eligible costs for the project:

- The Government of Nunavut's legislature must approve its funding for the project;
- Total project funding must be sufficient to complete the project, in respect of submitted bid prices;
- Contingency is appropriate to address construction risks;
- The Government of Nunavut must undertake a viability assessment of the asset and confirm that it has the financial ability to operate the asset;
- The Government of Nunavut demonstrates that all national security risks are accounted for and addressed as they relate to all aspects of the project and its respective assets to the satisfaction of Canada;
- The Government of Nunavut has secured all necessary Federal permits, or has advanced them to a state where the risk of impact on the project is minimal, in Canada's opinion;
- The Government of Nunavut must demonstrate that it has secured land leases for the Greenland terminus and the two landing sites in Nunavut, or has advanced them to a state where the risk of impact on the project is minimal, in Canada's opinion;
- For costs associated with contracts, Nunavut will satisfy Canada that contracts are awarded in a way that is fair, transparent, competitive, consistent with value-for-money principles, or in a manner otherwise acceptable to Canada, and if applicable, in accordance with the Canadian Free Trade Agreement and international trade agreements; and
- A climate change resiliency assessment must be completed to Canada's satisfaction in accordance with the Climate Lens General Guidance and submitted to Canada.

Eligible costs can be submitted for reimbursement once the payment conditions listed above have been met.

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Continued funding for this project beyond fiscal year 2019-20 is conditional on the following reporting requirements:

- Providing substantive costing details to Infrastructure Canada through Project Progress Reports. Details should include, at a minimum, updated information with respect to:
  - Cost breakdowns;
  - Detailed construction timeline;
  - Capital costs contingency levels;
  - Updated results information; and
  - Any relevant changes.

Project Announcement(s)

Nunavut is responsible for communicating the requirements and responsibilities outlined in the Agreement's Communications Protocol to ultimate recipients. Nunavut will work with Infrastructure Canada to jointly communicate Canada's funding commitments as soon as possible, to plan and participate with Infrastructure Canada in any future media announcements or events related to the project's progress, and, to produce and erect signage at each of the project sites acknowledging the federal government's contribution to the project in accordance with the signage guidelines to be provided by the Government of Canada.

I would like to take this opportunity to thank you for your collaboration and commitment to the successful delivery of the Investing in Canada Infrastructure Program in Nunavut. I look forward to working with you as we continue to implement this long-term infrastructure program for the benefit of all Canadians.

Sincerely,

The Honourable Bernadette Jordan, P.C., M.P.
Minister of Rural and Economic Development

c.c. The Honourable François-Philippe Champagne, P.C., M.P.
Minister of Infrastructure and Communities

The Honourable Navdeep Bains, P.C., M.P.
Minister of Innovation, Science and Economic Development

Enclosure:
List of Approved Project

List of Approved Project

The project listed below has been approved for federal funding under the *Canada-Nunavut Integrated Bilateral Agreement for the Investing in Canada Infrastructure Program*. The accompanying letter describes the conditions that must be met before Canada will pay eligible costs for a project. For projects with Environmental Assessment or Aboriginal consultation requirements (Columns I and J), Canada can pay eligible capital costs for a project, however, construction cannot start until obligations are met.

INFC Project ID	Provincial / Territorial Project ID	Project Title	Project Description	Funding Stream	Outcome	Investing in Canada Infrastructure Program Funding: Federal Cost-Share (% of total eligible costs)	Investing in Canada Infrastructure Program Funding: Maximum Federal Funding Amount	Environmental Assessment Requirements	Aboriginal Consultation Requirements	Climate Lens: Greenhouse Gas Emissions Assessment	Climate Lens: Climate Change Resilience Assessment	Other Federal Requirements
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
52954	577001	Nunavut Undersea Fibre Optic Cable Project	The project involves the fabrication and placement of a fibre optic linking the communities of Iqaluit and Kimmirut, Nunavut to Nuuk, Greenland, together with ancillary power supply and electronic equipment, and minor civil works at the cable termination points. The project will enable consumers, businesses and government services in the two Nunavut communities to have significantly improved internet access and meet the Canadian Radio and Television Commission National Target of 50 mbps download internet speed. Furthermore, the Project will contribute to ICIP's immediate outcomes of improved broadband connectivity, and increased structural capacity to adapt to climate change impacts, natural disasters and extreme weather events.	Rural and Northern Communities Infrastructure Stream	Improved Broadband Connectivity	75%	$151,213,315	TBD	Yes - Met	Exempted	Deferred	Yes
						Total	**$151,213,315**					

I hereby approve the above project for a total federal ICIP funding of up to $151,213,315 with the associated conditions specified in the accompanying letter.

Aug 15/19

The Honourable Bernadette Jordan, P.C., M.P.

Date

Minister of Rural Economic Development